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'HIS was suggested at the last Convention of the American Institute of Architects, invitations have been issued to all members of the Institute to submit competitive designs for the amusement and instruction of the participants in the next Convention, to be held in Rhode Island this year. The programme presented is a simple one, but has a special interest from the fact that some one of the designs may at some future time be actually carried into execution. It seems that a beginning has been made toward raising a fund for securing permanent accommodations in New York for the uses of the Institute, and the subject of competition is, very appropriately, the future Institute building. The structure is supposed to stand on an ordinary New York double lot, fifty feet front by one hundred feet deep, on the northeast corner of two streets, giving it a south and west aspect, and the plan is to include, as would probably be necessary, offices and stores for renting, to lighten the burden of interest upon the Institute, which would find sufficient space, at least for its present modest needs, upon one or two floors. The conditions are such as every architect will understand, and it seems altogether likely that a large number of designs will be offered. There is an attraction to the ambitious professional man in the idea of competing with his fellows for the favor of judges whose verdict he can respect, which will, we think, induce many of the ablest architects in the country to set aside some hours out of their overworked lives, to indulge once more in the pleasure of artistic toil pursued for its own sake, and for the sake of the intelligent sympathy that comes to them so rarely. The original suggestion of the competition was made with the idea that the interest excited by a competition of pure design, unhampered by the conditions of ordinary practice, might lead to the development of some characteristic features, which would afford a dim glimpse of that vision of the future, the American style. We cannot say that we have much hope of this, our own fancy being that the American style, when it comes, may be the outgrowth of those gigantic buildings now demanded in our crowded cities, for which neither the old forms nor the old modes of construction suffice, rather than a development of the commonplace architecture of ordinary use, but, however that may be, the work of first-rate architects intent upon winning the applause of their professional brethren is sure to be the very best that the country can at present produce.

THE bankruptcy of the contractors for the London Courts of Justice has some interesting points. According to the report in the *Builder*, their misfortune seems to have been mainly caused by disputes in regard to extras, of a kind familiar to architects who have had experience in important work, but none the less instructive as showing the peril to a contractor of leaving such matters to be adjusted in some random manner, months after the architect and owner have forgotten all about them. The statement made to the creditors shows that the interpretation of the contract for the Law Courts practically determines the whole financial condition of the firm, a claim being still unsettled for extras amounting to one hundred and twenty thousand pounds, which would, if allowed, not only suffice to pay the debts, but to leave the contractors a handsome surplus. As the creditors are naturally interested in this claim, an account of the manner in which it accrued was given them, from which it appears that the original tender was a little less than seven hundred and twenty thousand pounds, but the contract price was reduced before signing, by striking out some of the items included in the original bills of quantities, to about seven hundred thousand. In the course of the work some of the items so struck out were re-introduced, by order, and were of course charged for as extras, while many other variations from the contract were made, some of them affecting the largest items in the estimates. As an instance, it was mentioned that the original tender was made with a provision for notching or "joggling" the stones of the masonry, but before signing the contract the representatives of the Government struck out this, in order to save the expense.

WHEN the work came to be built, however, the architect, Mr. Street, demanded that the stones should be joggled, and on the explanation of the contractors that their agreement did not require it he sent his man to them to say that work built without joggling would be thrown down with crowbars by his direction. The contractors then took measures to cut joggles in the stones, and expended in this way seventeen thousand pounds—nearly eighty-five thousand dollars, expecting, of course, to be paid for work which was expressly stricken out of the original estimate; but on making their claim they were told that no written order had been given for the change, and that the claim would not be allowed. A second instance of costly changes, made at the request of the architect, was found in the case of the roofs of the courts. In the contract drawings a single design was given for all the roofs, but when the work came to be done, Mr. Street insisted that the roof of each court should be of different design, and the contractors were put to a large additional expense in procuring new patterns and altering their mode of work, for which no compensation whatever was allowed them. A third claim, amounting to about ten thousand pounds, was for rubbing the interior stone-work twice. Mr. Street, the contractors say, ordered the rubbing to be done at an early stage in the operations, although representations were made to him that the work would be thrown away; and the result was that the whole had to be done over again subsequently. In regard to the work which they agreed to do, the contractors show that their calculations were accurately made, and, as it proved, the actual cost of the work specified had not in a single instance exceeded their estimate; but on account of the "thousands of alterations" which had been made they were obliged to spend a third more money than would have been needed to complete their contract. Of this extra outlay, which with interest and a reasonable profit would amount to one hundred and eighty-six thousand pounds, or nearly a million dollars, Mr. Street, they asserted, had refused to certify more than ten thousand pounds, although most of it was incurred through his order or request; and they had no resource but to make a direct claim from the Government. If their contract, like most, provides that no order for extra work shall be valid unless given in writing, it is safe to say that they will lose their case, and they and their creditors must submit to the consequences of their incautious conduct, unless the Government should see fit to relieve them out of pure benevolence.

THE Commissioners appointed to consider the question of granting permission for building an underground railroad beneath Broadway have made a report, unanimously recommending that the permission should not be given. In the clear and sensible summing-up of the facts which the report contains, it is shown that the cost of constructing the road, which would involve the excavation and removal of a prism of earth and rock forty-two feet wide, twenty-seven feet deep, and ninety-five hundred feet long, through the very middle of the traffic of the busiest street in the world, besides the other and far greater work of shifting sewers, gas and water-pipes, building the double tunnel, and supporting or underpinning the buildings along the route, would be so enormous that the privilege of beginning operations should certainly be withheld from any association which could not prove its ability to carry them through to the end, as well as to provide for equitable compensation in case of unavoidable injury to private interests. The association which petitioned for the concession, however, so far from ap-

pearing well prepared to meet all these requirements, could only show subscriptions for about twenty thousand dollars of its stock, and of this but a very small portion had been actually paid in. Besides this, there was no attempt to prove that the proposed road, even if built, would connect with other roads at either end of its route; and the Commissioners very properly say, in view of all the circumstances, that "it clearly appears" that "the present capital and credit of the petitioner, and the financial status of its present officers, directors and shareholders are not sufficient to carry on or complete the proposed railroad;" and "that the railroad, if completed, and not operated in conjunction with other similar roads, forming a completed system, would be of no practical value or utility." We venture to say that every one who has read the testimony presented to the Commissioners will entirely agree with their sober and business-like judgment, and if, as is probable, their recommendations shall be followed by the Supreme Court, the people of New York may be congratulated upon their escape from an attempt to abuse their confidence and patience for the sake of enriching a few speculators.

WE publish in another column a letter from a well-known New York architect, describing his adventures in a personal test of the facilities for escaping from fires in lofty buildings, to which we would call the special attention of our readers. Underneath our correspondent's lively narrative there is a serious moral, and one cannot help wishing that it might be the lot of other architects, once in their lives, to see danger as near to them, and escape it as unharmed as he. We know the pressure which is often brought to bear upon architects to build with as much regard to show and as little to safety as possible, but the most complaisant servant of speculators, if he could be brought to meet death face to face in a blazing hotel or factory, would find himself thenceforth armed with new firmness in insisting upon those safeguards which he could easily devise if he wished. One suggestion in Mr. Bloor's letter, in regard to the advantage which the insurance companies might derive from a more efficient surveillance of the small district in New York in which so vast an amount of property is concentrated, deserves serious attention. For ourselves, we may say that nothing strikes us more forcibly, on many occasions, than the strange indifference of underwriters to circumstances which often increase ten-fold the risk in the buildings which they insure, without the slightest advantage to any one. For example, we had occasion not long ago to examine the cellar of a store on a principal street, full of valuable property to the very roof, and observed that the pipes from the furnace, including, if we remember rightly, the smoke-pipe, were wrapped with paper of all kinds, in several layers, tied on with strings. It was warm weather, and the furnace was no longer in use, but on making inquiry we were told that the papers had been on all winter. The cellar was roughly plastered, but the ends of the furring strips on the walls were visible, and the spaces between them were open. Lighting a match, and holding it near one of these openings, the flame was drawn out by the strong upward draft, showing that any fire originating in the basement would have run immediately to the roof. The building had but one narrow wooden staircase, so that in case of a conflagration the occupants of the upper stories would have had small chance for their lives, but, independent of peril to individuals, here was many thousand dollars worth of property, for which various underwriters had made themselves responsible, kept for months in imminent danger of destruction by a piece of carelessness which a two-minute visit of an insurance patrol would have remedied.

THE mild despotism which rules the building affairs of New York has fallen into a little ridicule the past week, on account of a certain oversight of one of its inspectors. It seems that the lawfully authorized official reported a lack of means for escape from fire in the House of Detention on Mulberry Street, and the Bureau forthwith issued orders that balconies and iron ladders should be provided on the exterior. The Police Commissioners obeyed the mandate, and the fire-escapes were erected. After a considerable time some unusually intelligent person noticed that all the windows opening on the new fire-escapes were heavily barred with iron, so that no one could possibly get out of them, no matter how hot the fire might be behind him. It certainly seems cruel to provide prisoners with fire-escapes which they can only look at through an immovable grating, and the obvious remedy would be to cut away the bars; but in this case all the prisoners would decamp at the first opportunity, and the Police Commissioners are left in the singular situation of being obliged either to allow their captives, mostly innocent witnesses, to run the risk of being burned alive, or to provide them with means of escape available whether there is any fire or not.

THE Building Bureau, notwithstanding the prominent position which it now occupies in the minds of the people of New York, is managed with extreme economy, the total appropriation for its maintenance last year having been but thirty-six thousand dollars. The work of the Bureau is done without requiring any fees from those having transactions with it, and there is nothing but the appropriation to pay the salaries of the men who control the vast building operations of New York. At present thirty-three persons constitute the whole force of the Bureau, these being required not only to examine and pass upon the plans and specifications of every building constructed or altered within the city limits, but to inspect from time to time the manner in which those plans are carried into execution, and besides all this, to examine all the old buildings about which they, or any one else, has reason to think that there is anything objectionable. By working over hours, ten men, including the chief inspector, are able to keep up with the business of the office, and twenty examiners, at a salary of nine hundred dollars a year, have to divide among them the supervision of the work on at least four thousand buildings, old and new, every year. The slightest reflection will show that it is quite impossible for one man to keep anything like an efficient watch of two hundred buildings a year, and it is much to the credit of the Bureau that it has accomplished so much; but its usefulness can never be so extensive as it should, until money enough is granted it to provide for adequate service.

THE report of the Boston Park Commissioners for the past year contains an instructive commentary on the ultimate pecuniary value of public parks to a community which has the nerve to make the preliminary sacrifice needed to secure them. In 1877, the district in that city known as the Back Bay, then about half built over with first-class dwelling-houses, had fallen into disrepute, on account of the annoyance arising from a foul tidal basin which bordered its western and more remote portion. The immediate surroundings of Boston are not too savory, to say the least, but the new region enclosed between the basin and the river, both of which received large amounts of sewage, had become particularly offensive, and a sort of panic seized the owners of the property, many of whom sold their lands and houses at a loss and moved away. To save the large interests of the section, it was then decided to fill the noisome basin, and convert most of its site into a park, bordering the natural stream of fresh water which flowed through it, and which it was necessary to provide with some access to the river; and in accordance with the wholesome Massachusetts law, a large part of the estimated cost was assessed, under the name of "betterment," upon the property which was thought likely to be benefited by the improvement, this including all the estates within half a mile or so of the park. As a rule, these assessments were cheerfully borne, the owners of the estates perceiving that they gained much more than they paid for. Beyond the resources so obtained, the increase in the taxable value of the whole territory was looked to for reimbursing the cost of the improvement. The prudence of these calculations has already been shown, although the park is yet incomplete. As soon as the decision was made to reclaim the basin, a general advance in prices of real estate took place all over the Back Bay territory, together with a renewal of activity in building operations, which have together increased the taxable valuation to such a degree that the revenue from the district was nearly a quarter of a million dollars greater in 1882 than in 1877. The total gain in taxes and betterments has amounted in five years to more than one million dollars, while the whole cost of the park, including the purchase money for the land, and all the expenses for filling and improvement, has amounted thus far to but eleven hundred thousand. It is obvious that as the receipts for taxes will continue to increase, while the expenditure on the Park will soon cease, the balance will before long be in favor of the enterprise, which, instead of a costly luxury, will be found before many years, not only to have cost the tax-payers nothing, but to be as much a source of profit as a public gold-mine would be.

BUILDING SUPERINTENDENCE. — XXVII.

THE trusses over the auditorium and gallery require to be submitted to similar processes, which it is unnecessary to describe at length. The former, however, as shown in Figure 183, not being tied at the foot of the rafters, exerts a thrust upon the walls at each side, which would certainly overturn them if not counteracted, and in order to be able to provide the necessary resistance we must know the direction and amount of the thrust. A glance at the diagram shows that the truss really consists of three portions, the upper part, *A E F*, forming a rigid frame, resting upon two other frames, *E K M I B*, and *B F L N J*, the latter of which are inclined inward from the wall, and tend to push it outward at their foot, and, disregarding the various pieces composing these inclined frames, which serve principally as braces against deformation by wind-pressure, we may consider each as equivalent to a single straight timber, or inclined column, acting as shown by the dotted lines *E M* and *F N*. It is easy to ascertain the thrust at the foot of this column, by laying off *A B* in Figure 184, equal, by any required scale, to the vertical pressure on *E*, that is, to half the weight on the truss *E A F;* then drawing *A C* on the diagram, parallel to *E M*, and *B C* horizontally intersecting *A C* at *C*, *B C* will then show by the scale the horizontal outward thrust on the wall at the point *M*, in Fig. 183. This being ascertained we must now find the shape and size of buttress, if any, which is necessary to keep the walls from being pushed over by the thrust. We can best do this graphically, as follows: —

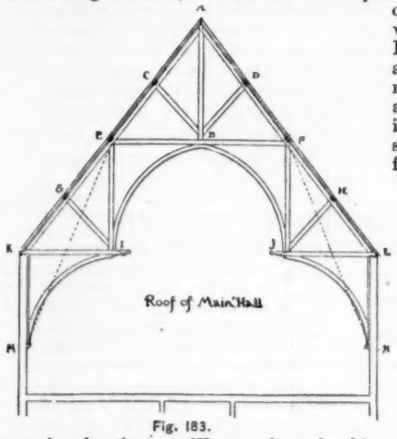

Fig. 183.

Beside the diagram for thrust in Figure 184, draw a section of the wall. The scale of this section, which is in a certain number of feet to an inch, has nothing to do with that of the stress-diagram, which is in pounds to an inch, and any scale may be used. Fix the position of the section so that, by its scale, the point *C*, which represents the place of application of the inclined force of the lower part of the truss, supposed to rest upon a corbel projecting from the wall, will come at the proper distance from the wall-surface, and draw a line at *Y*, representing at the same scale the floor-line, which, if the wall is anchored to the timbers of the floor, would be the point about which it would revolve in overturning. Next find the weight of a portion of wall extending from the floor-line up to *K* in Figure 183, and equal in width to the space between the windows, which we suppose to be five feet. Add to this the actual weight of the portion of the roof supported by *K E*, Figure 183, not including any allowance for snow or wind. The sum will give the vertical pressure which combines with the oblique pressure *E M* to change its direction in its passage through the wall. Laying off now this vertical pressure downward from *C*, in the diagram of Figure 184, to the same scale of pounds as the other pressures, we find that it extends to *D*. Draw now *A D*, which will give the direction and amount of the total combined pressures at the floor-line, and *X Y*, drawn parallel to *A D* from *X*, the point where *A C* prolonged strikes the plane of the centre of gravity of the wall, will give at *Y* the actual position of the intersection of this modified pressure-line with the base-line of the movable portion of the wall. The point *Y* falls outside of the wall, showing that its unassisted stability is not equal to the oblique pressure upon it, and that it will be overturned.

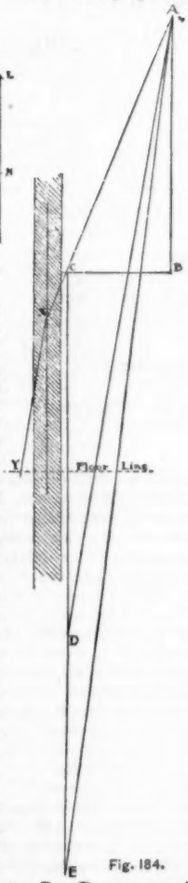

Fig. 184.

There are three ways of adding to the wall the requisite support. The most obvious of these is the addition of exterior buttresses, the weight of which will serve to deflect the pressure-line more directly downward, at the same time that their position will improve the stability of the wall by removing the point about which the pier must revolve, in order to overturn, beyond the intersection of the pressure-line with the base. The second resource is the construction of interior buttresses, the weight of which will also serve to deflect the pressure-line to a direction more nearly vertical, at the same time removing the point *C*, in Figure 184, horizontally away from the wall, until the point *Y* is brought within the base. The third method consists in piling up masonry in the form of pinnacles above the wall at the proper places, increasing by their weight the vertical component of the total pressure, until the line falls within the base of the wall, with little or no help from buttresses, either exterior or interior. This would be not only a perfectly legitimate and safe construction, but perhaps the most economical of any, since the weight of all the masonry extraneous to the wall itself would be applied in increasing the stability of the pier, while buttresses, either interior or exterior, must be continued to the ground, although the portion below the floor-line, much the largest part of the whole, serves in this case only as a support, without adding anything to the stability of the wall above the floor-line. There would probably be, however, some objection on the part of the building committee to such an unusual construction, and as we have ourselves some fear that masses of snow sliding down the roof might push the pinnacles off, with disastrous results, we will abandon the idea of employing this method. Of the two others, that of inside buttressing seems the less adapted to the circumstances, as the projection of the buttresses would obstruct the side aisles of the hall. If the room were planned with high walls and flat ceiling, the acoustic advantage of these projections would be sufficiently important to outweigh the objection to them as obstructions, but in the present case the shape of the roof, the echoes from which would be broken up and dissipated by the net-work of trusses, and the regular succession of braces springing from the corbels, which would intercept the waves of sound conducted along, as well as reflected from the walls, give all the security against unpleasant reverberation which could be obtained by interior projections, and it will be best on other accounts to avoid them by placing the buttresses on the outside.

We will first make trial of a buttress of the shape and size shown in elevation in Figure 185, and in plan in Figure 186. Finding first the weight of the buttress from the floor-line to the top, we add this to the weight of the wall as a part of the vertical force in Figure 184, where it is represented by *D E*, *C D* representing the weight of the wall exclusive of the buttress. The whole vertical force will therefore now be *C E*, and *A C*, the oblique thrust of the truss, remaining the same, the new resultant force will be represented, in direction and amount, by *A E*. If then, we draw a line, parallel to this new resultant, from the point where the line of thrust intersects the plane of the centre of gravity of the pier and buttress combined, to the floor, or base line, we shall at once see whether the whole will be stable.

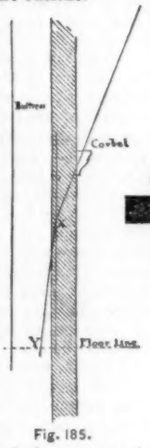

Fig. 185.

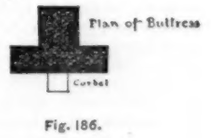

Fig. 186.

The first step in this process is to find the position of the centre of gravity of the pier and buttress. In the plan of the pier with its buttress, Figure 187, find the centre of figure of each portion separately, by drawing the diagonals of the parallelogram formed by each. Join these centres by the line *A B*. The centre of gravity of the whole figure will then lie on the line *A B*, at a point which must divide *A B* into portions inversely proportional to the areas of the parallelograms in which its ends respectively lie. The area of the parallelogram representing the wall is $5 \times 1\frac{1}{3} = 6\frac{2}{3}$ square feet; that of the parallelogram representing the buttress is $2 \times 1\frac{2}{3} = 3\frac{1}{3}$ square feet. Three and one-third is just one-half of six and two-thirds, so that the point *C*, which divides the line *A B* at one-third of its length from *E*, will show the centre of gravity of the complete figure, and if the pier and the buttress are of the same material, and carried to the same height, it will lie in the line of the centre of gravity of the whole mass. For our purposes we can assume that this is the case, and that *C* lies in the plane of the actual centre of gravity. We then find the corresponding point in Figure 185 by transferring its distance from the inside of the wall with the divider

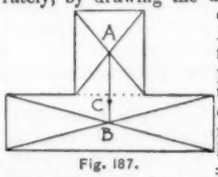

Fig. 187.

and draw a vertical line through it as shown. The line of the thrust of the roof, prolonged downward from the corbel, will intersect this new line of the centre of gravity at X, and X Y, drawn from X parallel to A E in Figure 184, will show the line of the resultant pressure due to the influence upon the thrust of the weight of the pier and buttress. This line will strike the floor, or base-line of the movable portion of the wall, at Y, and as this point fulfils the condition of being nearer to the vertical line drawn through the centre of gravity than it is to the exterior of the mass, the pier and buttress, if well anchored at the floor-line, will safely resist the effort of the thrust of the roof to overturn them.

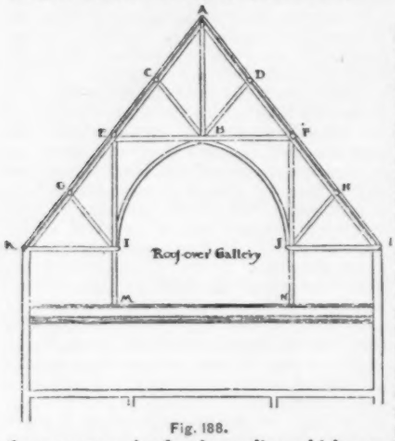

Fig. 188.

The roof over the gallery, as we see in Figure 188, being supported by posts at M and N, with suitable braced girders running back from E I and F J, to carry the truss intermediate between the one shown in the figure and the end wall, resolves itself simply into the case of that over the stage, which we have already investigated; the curved braces B I and B J being added merely for ornament and to correspond with the main roof. We have now only to calculate the necessary size for the purlins, which are virtually beams 12 feet in length, having a clear span equal to this distance less 6 inches, the width of the principal rafter, and subjected to a distributed transverse stress, due to their own weight, the weight of the portion of roof which rests upon them, with an occasional wind-pressure added of 44 pounds to the square foot; and the sizes of the common rafters, which are also inclined beams, of a length equal to the distance between the purlins, and subjected to a distributed transverse stress, due to their own weight, with the weight and wind-pressure upon the portion of roof which each carries. The purlins should be nearly square in section, and each supports the strain of a portion of roof $11\frac{1}{2}$ feet long, and of a width equal to the distance between its centre and the centre of the next one, which in this case is 15 feet. We have previously estimated the vertical load, including weight of snow, on each square foot of the roof-surface to be 30 pounds, which would here be equivalent to a pressure, normal to the plane of the roof, of 19 pounds. To this must be added the maximum wind-pressure, which we found to be 44 pounds, making 63 pounds per square foot as the total transverse pressure. The purlin sustains $15 \times 11\frac{1}{2} = 172\frac{1}{2}$ square feet, so that the stress upon it will be $172\frac{1}{2} \times 63 = 10868$ pounds. Its own weight will be, at the utmost, 500 pounds, and over the auditorium the underside of the common rafters will be lathed and plastered, adding a weight of about 10 pounds per square foot, or 1725 pounds upon the whole space sustained by each purlin. This, as well as the weight of the purlin itself, being a vertical pressure, of which a portion is transmitted down the rafters, while only the component normal to the roof-plane exerts a stress upon the purlin, we can find the normal pressure corresponding to the vertical weight of 2225 pounds, either graphically or by applying the proportion of 30 : 19, which we have just ascertained to represent the same relation in the case of the weight of roofing and snow. This would give $30 : 19 = 2225 : 1409$. Adding this to the others, we obtain $10868 + 1409 = 12277$ pounds as the measure of the distributed transverse stress upon the purlin. This is a severe stress for a timber $11\frac{1}{2}$ feet long, and we shall do well to employ Southern pine for the purlins, instead of spruce, on account of its superior stiffness. Using the formula before employed in calculating the tie-beam, $\frac{b\,d^2\,C}{sL} = W$, we shall have here:

$W = 12277$
$S = 6$
$L = 11\frac{1}{2}$
$C = 550$, the constant for Southern pine, as 450 is for spruce.
b and d are both unknown.

Instead of transposing the formula, it is often less trouble to assume certain dimensions, and try whether they fulfil the required conditions of strength. In this case we will try whether a 10″ x 10″ stick will do. Substituting these dimensions for b and d in the formula, and remembering that the weight, 12277 pounds, being distributed uniformly along the purlin, exerts only half as much breaking stress as if it were concentrated at the centre, we shall have $\frac{10 \times 10^2 \times 550 \times 2}{6 \times 11\frac{1}{2}} = 15942$ pounds, as the distributed weight which will be safely borne by the timber. This is greater than we need, and we will try an 8″ x 10″, which we find to be capable of supporting safely 12754 pounds, or a little more than the given weight, so we adopt these dimensions.

The rafters are last to be considered. The steady stress upon each of these, consisting of the vertical pressure of the portion of the roof with its weight of snow resting on it, acts vertically, and the inclination of the rafter being oblique to this vertical force, it is necessary to resolve the single stress due to the weight into two, one of which will act in a direction normal to the inclination of the rafter, forming a transverse strain of the ordinary kind, while the other acts along the rafter by compression, and is to be resisted by the rafter acting as a column. The clear span of each rafter, from purlin to purlin, is 15 feet, less 8 inches, the width of the purlin, and as the rafters are spaced 16 inches from centres, each carries a portion of the roof $14\frac{1}{3} \times 1\frac{1}{3}$ feet in area. The weight upon this, including that of the rafter itself, the roofing boards and slates, the lath and plaster underneath, and a possible load of snow, will be $14\frac{1}{3} \times 1\frac{1}{3} \times 40 = 764$ pounds. Drawing a vertical line representing this weight, at any scale, we make it one side of a triangle, of which the other two sides are drawn respectively parallel to the direction of the rafter, and at right angles to it. The length of these two sides, measured at the same scale, will give the components of the vertical pressure, which act along the rafter and transversely to it. We shall find the transverse component to be about 455 pounds, and the other, acting to compress the rafter, about 600 pounds. At 400 pounds per square inch, the sectional area of the rafter, acting as a column, required to resist this stress would be $1\frac{1}{2}$ square inches, and the dimensions needed to resist the transverse strain must be added to this. The transverse component of the simple weight of roof and snow we have just seen to be 600 pounds. To this must be added the wind-pressure, which is a direct transverse strain, amounting, by our previous estimate, to 44 pounds per square foot, or $14\frac{1}{3} \times 1\frac{1}{3} \times 44 = 841$ pounds on the whole area supported by each single rafter. Adding the two results together, we have $600 + 841 = 1441$ pounds as the distributed transverse pressure on the rafter. By the formula previously employed, assuming the rafters to be of spruce, with a value for C of 450, we find that 3″ x 7″ timbers will give a resistance of 1540 pounds; and suppose $1\frac{1}{2}$ square inches of the sectional area, comprising a slice $\frac{1}{2}$″ wide by the depth of the rafter, to be occupied in resisting the longitudinal stress, we shall have remaining a piece $2\frac{1}{2}$″ x 7″, whose strength, according to the formula, will be $\frac{2\frac{1}{2} \times 7^2 \times 450 \times 2}{14\frac{1}{3} \times 6} = 1436$ pounds. This is smaller than we need, but the difference is so very slight that we need not regard it, and we adopt this as the proper scantling.

BUILDERS' SCAFFOLDING.—IX.

SKELETON structures are of little avail to encounter forces without being stiffened by means of bracing, and hence bracing forms an important part of their design and construction. The bracing of scaffolding and of staging structures, like that of all skeleton structures, is of vital importance to their stability, and in most cases of complexity requires considerable skill in its devising. The essential principles which govern the design of skilful bracing of skeleton structures, such as composed of a system of separate standards, columns, etc., braced or latticed together, forming a symmetrical compact framework, being those which apply to all braced skeleton structures, will be those which we shall consider under simple conditions of application in a braced pier or trestle. Motives of economy, higher efficiency, convenience of detail, special adaptability to its purpose, magnitude of the structure, its position, whether vertical, horizontal or oblique; the manner in which the structure is loaded, the direction of its encountering external forces, and the nature of those forces, have each and all their special modifying influences on the *kind*, intensity, and direction of strains, which will occur at certain points under each or any combination of such conditions. Thus in bridge-trusses, a loaded floor must be supported at certain points, imposing a transverse load to be distributed along the chords. It is sometimes convenient as well as economical to divide the panels into half-panels when the span is large, so as to supply these points close enough together along the chords for the proper intervals of support, while at the same time adopting a convenient, efficient bracing angle, so that in such half-panel arrangement every oblique brace will pass or intersect an intermediate vertical web-member at the middle point of its height, the intermediate vertical web-member marking the half-panel points. On the other hand, in skeleton pier structures, in which the load is supported directly by columns or standards, the bracing, both horizontal and diagonal, is designed for the purpose of stiffening the structure against the distorting influences of horizontal forces, and at the same time of effecting economy of materials and labor; because without such bracing, the sectional area of the columns would require to be enormously enlarged in proportion to increase of height, so that in very high structures it would be practically impossible either to construct them of cast-iron, or afterwards

erect them. The false-works, staging, and constructive appliances would also have to be of such increased strength and power as to make such a system of ponderous construction commercially prohibitive. Resort must therefore be had to devices which shal economize materials, and remove the other objections alluded to, by affording an economical means of rigidly connecting the columns together, so as to render them practically one whole compact, independent structure, by preserving their mutual relation and position unaltered, so as to afford continuous mutual support to each other through the medium of a solid web connection, or at uniform intervals by latticing or bracing, which shall occupy systematic lines traversed by the strains as they are distributed throughout the structure, passing from column to column as actuated by external forces. We here take the illustration of an isolated skeleton pier to explain the operations of bracing, because of its integrity admitting of a more distinct view of the subject than would a section of scaffolding, especially as the Scotch crane standards of the composite description, and the French *sapine* already described in these papers, are of this type of structure.

For the systematic consideration of the purpose and action of bracing, we must first review the nature and extent of the forces which in scaffolding and staging are intended to be counteracted in practice. These are primarily divisible into external and internal forces. The external forces will naturally be divided into the insistent, permanent or dead loads, the weight of superstructure and substructure, and of the moving or temporary loads.

As we have already given some data in connection with *ledger* scaffolding, we shall here commence with the permanent loads for *framed* scaffolding,[1] consisting (1) of the weight of the structure, viz.: standards, braces, runners, horizontal ties, lookouts, etc., which may (with iron-dogs, spikes, etc.,) be estimated in round numbers, at 30 pounds per cubic foot for white-pine. Traverse rails, 10 to 12 pounds per foot lineal. (If rack-rail is attached for toothed wheel-driver to gear in for traversing motions, allow an additional 10 pounds per foot lineal.) (2) The weight of the moving load, which will consist of hoisting crane and materials.

The weights of English types (wood frame) of overhead travelling-crabs, by hand-rope or crank-power, for three sizes, are as follows, for 35-foot spans: —

2	ton size	3	tons,	0	cwts.
4	"	3	"	12	"
6	"	4	"	13	"

(The spans run from 16 to 35 feet.)

The hoisting-chain will consist of 50 feet, or more, according to height and purchase used, of chain of the following weights, per fathom of 6 feet.

⅜"	diameter of rod at	8	pounds weight,	its working load is	1.	ton.
½"	"	"	12	"	"	"	1.7 "
⅝"	"	"	22	"	"	"	2.2 "
¾"	"	"	32	"	"	"	4. "
⅞"	"	"	43	"	"	"	5.5 "
1"	"	"	56	"	"	"	7. "

For other spans the decreased weight of frame alone (less weight of crab, travelling-frame and iron end-carriages) will be as cube of span.

The *crabs* weigh separately, for the above sizes, as follows: —

2	ton size,	2	cwt.	0	qrs.	14	lbs.,	single purchase,	cwt.	qr.	lbs.
4	"	3	"	0	"	0	"	"	3	" 1 "	12	double do.
6	"	4	"	3	"	15	"	"	5	" 1 "	22	" "

The weight of end-carriages and travelling-frames, separately, are not at present known to the writer.

The weights of steam overhead travelling-cranes, with boilers, etc., complete, are as follows (information furnished by kindness of Tannett, Walker & Co., Leeds, England.): —

Size.	Span in feet.	Total weight of Traveller.	Weight of one End-Carriage.	Weight of Steam Crab, Boiler, etc.
5-Ton.	23′ 7½″	11 Tons.	10 cwt.	2½ tons.
10 "	38′ 1″	16 "	16½ "	4½ "
15 "	40′ 0″	21½ "	26 "	4½ "
20 "	32′ 6″	15 "	28 "	4½ "
20 "	42′ 1¾″	20 "	28 "	4½ "
30 "	43′ 6″	23 "	30 "	5 "
50 "	37′ 6″	50 "	30 "	11 "

The weight of hoisting-chain, block, hook, etc., are included in above.

As block tackle will be used with these cranes and also with the larger sizes of the hand-power cranes to increase the *purchase*, the chains above specified will be strong enough for higher powers, according to the number of sheaves in the lower or moving block, which will accordingly reduce the strain on the hoisting-chains. The theoretical gain of power (for the mere equilibrium of the *power* and *weight*) and consequent loss of velocity is equal to twice the number of sheaves in the moving block; but the practical gain is less, owing to friction. Therefore, if one sheave is used in the moving block, the strain on the chain tackle is only one-half (theoretically) of the direct strain of weight raised, without the intervention of a moving block. If two sheaves are in the moving block the tackle is strained theoretically only one-fourth of the direct strain; but the length of chain required is doubled in the first case, and quadrupled in the second case. It is thus preferred to increase the lifting power of small chains than to employ larger chains than one-inch diameter of rod, because of the sudden, violent jerks to which it is liable, as iron of larger diameter is less fibrous and more liable to be of rather crystalline structure.

In Scotland and parts of England, brick, rubble and mortar are hoisted to the masons' scaffold in a box, containing three hundred bricks, weighing, with suspension-chains, about 2,500 to 2,600 lbs.

If any part of the masons' scaffold is made to rest upon the cross-timbers of the frame scaffold, its weight and that of its loading of materials, etc., and the oscillatory influences which it may occasion to the frame scaffold, must be added. As the maximum weight of materials hoisted by the crane at any one time, together with the gross weight of crane in working order, with coal, etc., in the case of steam power, may all come together upon any standard, the maximum estimated load for scantlings of standards should include sufficient allowance for this moving weight, at double its static weight.

For staging and false-works the weight of floor and of floor system of girders, joists, planking, etc., an allowance should be made of ten to twenty pounds per superficial foot, according to spans and scantlings, of girders, thickness of planking, etc.

Different length trusses of the same special design have total loads in simple proportion to the load per foot run, of dead, live, or temporary loads, and in proportion to the cube of the span; while the strength of such trusses is as the square of the span.

The weight of iron-work, as girders, etc., forming a part of such structures, will depend on special features and details of the design, and hence no approximation can be here given, and therefore the weights of all such must be estimated from the individual parts in each case for itself.

Shelter-sheds or huts over crabs may be estimated from 1,000 lbs. to 4,000 lbs. weight, *i. e.*, five or six pounds per square foot of entire surface of walls, roof, floor, etc. (of wood), for boards and light frame joists, etc.

In order that bracing may not be rendered inoperative in preserving the stability of the structure, the columns or standards must have secure foundations. When they are of temporary construction, and other than hard ground, gravel, sand, rock, or other solid foundation, such as timbers, girders, joists, arches, flags, lintels, soft or *made* ground, drains, sewers, vaults, special devices suitable to the case must be adopted to render the foundation secure against rupture, settlement, or other movement.

In staging, the distribution of weight of floor system, and equally distributed symmetrical load over a regular *square* system of columns is, on the *inside* columns, equal to the square space enclosed by four contiguous columns, or the square of the span between columns, if the columns be all equidistant; if not equidistant, it will be the rectangle of their respective distances in directions perpendicular to each other. On the *outside* columns the load will equal half of the square or rectangle; on the *corner* columns the load will be one-quarter of the contiguous square or rectangle.

For live, moving and temporary loads allow the greatest amount that can come on one standard, and that which might be collected together on the square of the length of a whole span, and its maximum strain will depend on the nature of the loads and on the extent of probable aggregation of the materials in maximum quantities. This must be treated as an unsymmetrical loading, the moments of the forces for which will be discussed farther on.

Next consider the action of wind-pressure on the various surfaces exposed to it, of the structure, superstructure, derricks, cranes, hoardings, awnings or enclosing surface surrounding a building in course of erection, and its scaffolding, such as alluded to in the October number.[2]

The manner of transmitting this surface pressure to the standards undiminished — in the case of staging it is delivered through the floor system to the top of the standards, and evidently in the case of a skeleton-pier — throws part of the weight on the leeward standards or columns, causing bending moments on all of their sections and consequently relieving the windward standards by this displacement of the forces.

The data for the mechanical action of wind on structures is not so satisfactory or precise as to be reliable to any degree of exactness.[3] However, Tredgold's estimated allowance for roofs of 40 pounds per superficial foot, with a factor of safety of 3 or 4, according to the nature of the exposure, might be ample for our purpose, though engineers in this country usually adopt 50 pounds pressure, as maximum wind-force on exposed structures, per superficial foot in a vertical plane, normal to the direction of the wind. The British Board of Trade requires an allowance of 56 pounds per square foot of all exposed engineering structures, with a factor of safety of four. Engineers of Continental Europe allow 55 pounds per superficial foot, perpendicular to the direction of wind, with the same factor of safety. Of course all leverage produced by parts of structures projecting beyond their supports or *fixed* portions, which multiplies the natural intensity of the wind must be duly allowed for. The vertical component of the action of wind-force upon an object standing on a platform produced by the leverage of its centre of pressure above

[1] Illustrated by Figure 15, in November number, page 217.

[2] A notable instance of the temporary covering-in with boarding, glass, etc., of the prospective building with its entire scaffolding, was described in the *Building News* of February 16, 1877, in the case of the Crédit Lyonnais Building, Paris.

[3] The present development of the functions of the United States Signal Service is very commendable, but until it has adopted the proper means designed for the satisfactory solution of problems of maximum wind-force on land structures, against plane and curved surfaces, and to what extent isolated concentrations of force take place, etc., its usefulness is curtailed in an important direction.

the platform, must not be overlooked in estimating the maximum transverse strains on horizontal members of the floor system of staging, false-works, etc. There is also another vertical element in oblique wind-force which must be duly allowed for, especially for large platforms or floors of staging. There is a prevailing direction for high winds in most localities, and this should be ascertained for any place for which estimates are to be made, and inquiry should be made as to the liability to oblique winds, either downward or upward, in consequence of peculiarities of local surface-contours, and a proper compensation allowed in the scantlings.

The pressure of wind is usually deduced from its velocity as recorded by the anemometer (cups) on the basis of Smeaton's formula,[1] or rather Rouse's communicated to Smeaton in 1758, which ignores the important fact that the gravity or density of the wind in motion considerably influences its mechanical pressure. The United States Signal Service by adopting the above formula ignores the importance of density. Professor Draper's cylinder anemometer records the direct wind-pressure, which ought to be preferred to the Signal-Service method. Mr. A. R. Wolff, in the *Engineering and Mining Journal* of September 23, 1876, shows from experiments made on various states of the barometer and thermometer, that a variation in temperature from 0° to 100° Fah., produces a difference in the pressure, for a given velocity, of over one-fifth of the total pressure, air having appreciable but variable weight: thus, when the barometer is 30 inches, and the thermometer 60° Fah., a cubic foot weighs 535 grains, and when barometer is 29.92, and thermometer 32° Fah., a cubic foot weighs 573.53 grains.

When the direction of the wind is oblique to the exposed surface, the force varies as the sine of the angle of incidence. A cylindrical or curved surface is estimated at half the diametric section.

The resistance offered by latticed surfaces to the wind is considerably more than the net area of the lattice bars or braces. It is estimated that there is only about 75 per cent of the interspaces between lattices which does not obstruct the free passage of the wind through the interspaces, and hence in estimating the effective resistant surface of latticed structures to the force of wind, it is usual to add, say, about one-fourth of the interspaces to the area of the braces or lattices, when these represent about one (or somewhat larger) per cent of the entire latticed surface.[2]

The effect on standards of wind-pressure acting upon any loose object, merely resting by its weight upon staging or platform, is practically the same as if it were fixed thereto, so long as the object is standing and not overturned by it, and in such case the bending moment on the substructure is limited to that which is required to overturn the object. The larger the surface exposure, proportionate to the weight of the structure or object for similar bases the less the stability, whether in solid or hollow form. The centre of wind-pressure may be taken as the position of the geometrical centre of the exposed surface.

Wood being specifically lighter than stone, brick, iron, etc., exposes a larger surface in proportion to its weight, in similar solid or hollow forms and positions. The figure and nature of the surfaces exposed, whether plane, corrugated, hollow, or indented, of either material, will influence the degree of the resistance it offers.

The more comprehensively and precisely all dangerous possibilities are provided for, the smaller is the permissible "factor of safety," which may be applied in the design of the structure. This would mean for important structures, economy of materials in providing the same amount of "safety" in the structure, for the reason that a high factor of safety increases the sectional areas of *all* the parts, their joints, connections, etc., indifferently, whereas provision for definite possible dangers only increases the sectional areas, etc., only of the special parts affected thereby.

The Circus Fire at Berdichev. — The fearful loss of life at the burning of the Berdichev Circus a month or so ago is said to have been due in large measure to the fact that, it being New Year's day, half the audience and all the firemen were drunk. The fire originated in a large open cask of kerosene which stood at the entrance to the stable, and from which the lamps were refilled as often as they went out. One lamp hanging above the cask fell into it, and in a moment the building was in a blaze. — *Exchange.*

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[1] The pressure in pounds per square foot of plane surface perpendicular to the wind $= \left(\frac{\text{Velocity in miles per hour}}{200.}\right)^2$ The formula is $P = V^2 \times .005$.

[2] The British Board of Trade Committee of Inquiry on the wind-pressure on railway structures, reported May 20, 1881, that for railway-bridges and viaducts, an effective wind-pressure of 56 pounds per square foot of vertical surface should be the maximum pressure, and that in order to insure a proper margin of safety in respect of wind-strains, the structure should be made strong enough to withstand four times the maximum wind strain; and that in the case of structures in which gravity alone is relied upon to counteract the tendency of wind to overturn it, a factor of safety of *two* is considered sufficient. The committee also recommend that experiments be made to ascertain the lateral extent of exceptionally heavy gusts, for lattice girders (trusses) or those of *open* construction. The pressure on windward girder to be estimated as if a *close* surface, and on the leeward girder: (1) If the surface area of open spaces does not exceed $\frac{1}{3}$ of whole area within the girder outline, a pressure of 28 pounds or half the maximum. (2) If between $\frac{1}{3}$ and $\frac{1}{2}$, 42 pounds or $\frac{3}{4}$, maximum to be allowed, (3) and if exceeding $\frac{1}{2}$, 56 pounds or maximum pressure to be allowed, as if a *close* structure. The committee found that at Bidston (near Liverpool) Observatory, a self-registering pressure-disc anemometer recorded on one occasion a pressure of 90 pounds per square foot perpendicular, and 80 pounds on another occasion; both were of short duration. They deemed the conformation of the ground in the vicinity induced an intensified velocity. At Glasgow, 47 pounds was the highest pressure recorded. They also found that the abnormal pressures at Bidston were not referable to momentum of moving parts of recording instrument, carrying it beyond the point of equilibrium under the wind-pressure acting at the moment.

THE $3,000-HOUSE COMPETITION. — V.

DESIGN SUBMITTED BY "*Moses.*"

GENERAL SPECIFICATION OF MASON'S WORK AND MATERIALS

REQUIRED in building and finishing a frame cottage in the suburbs of Brooklyn, N. Y., as per plan and this specification submitted by "*Moses,*" architect.

The dimensions, form, and arrangement, to be all in accordance with accompanying plans and detail.

Materials and Workmanship: — All the materials to be of good quality, all work done in a workmanlike, substantial manner, to the entire satisfaction of architect.

Excavation: — The cellar is to be excavated to a depth of 5′ 6″ below general grade of ground. All earth excavated to be graded about the building, as may be desired. Top soil to be kept separate, and placed on top of grading.

Brickwork: — Build the chimneys as per plan, of best quality hard-burned, selected brick, to rest upon footing-course of stone well bedded. Brick to be laid with best quality of lime-and-cement mortar. Carry up flues separate, and parget same, leaving them clear and clean. Chimneys where showing above roof to be neatly pointed up with cement-mortar, and to have a capstone 2½″ thick (with flues cut through) firmly bedded in mortar. Turn proper arches for all fireplaces and prepare for hearths. Face all fireplaces with dark-red, hand-made, hard-burned brick, neatly pointed in red mortar.

Stone-work: — Build the walls of cellar, and all foundations, as per plans, of good building stone 18″ thick, properly bedded and bonded together. All stone-work laid up in lime and cement mortar and neatly pointed, inside and outside. Foundation walls to go 3′ 0″ below ground-level. All walls to rest on large solid slabs of stone about 2′ 0″ wide, 3′ 0″ long and 8″ deep. Furnish and bed solidly 16″ x 16″ x 8″ stone slabs to support veranda and porch steps. Build walls for cellar entrance, outside, to grade, and inclined for receiving doors. Provide sills to cellar doors, and windows: window-sills 4″ thick, 8″ wide: door-sills to be 8″ thick and 18″ wide, properly bevelled.

Lathing and Plastering: — All the walls, partitions and ceilings, soffit of stairs, in first, second and attic stories to be lathed and plastered. The lathing to be done with well-seasoned narrow lath, reversing heading-joints every 18″. All lathing to have two coats — one brown coat, and one sand finish. All angles carried up straight and true. Angle of ceilings and walls to be neatly coved. Arches and beams indicated on second floor to be neatly plastered and beaded.

If required, cut away for and make good after carpenters, and other mechanics.

Conclusion: — Finish and complete all the work to the full and true meaning of the plans and specification, and remove all dirt and rubbish from the premises at the completion of the building.

GENERAL SPECIFICATION OF CARPENTER'S WORK AND MATERIALS.

The dimensions, form, and arrangement, to be all in accordance with accompanying plans and details.

Materials and Workmanship: — All the materials to be of good quality, all work done in a workmanlike and substantial manner, to the entire satisfaction of architect.

Framing: — All the timber for the framing to be of hemlock. Sills 4″ x 6″; plates, 4″ x 4″; corner-posts, 4″ x 6″, made of two pieces, or double, in one length from sill to roof. Floor-beams, 3″ x 8″, 16″ from centres. Beams for veranda and porch 2″ x 6″, 2′ 0″ from centres. Trimmers and headers to be double. Studs on sills of doors and windows, to be double; filling-in studs, and studs for partitions to be 2″ x 4″, 16″ from centers. All floors to have 2″ x 2″ bridging, well nailed to beams. All partitions and outside studding braced.

Rafters: — Rafters 2″ x 6″, 2′ 0″ from centres; ridge-board 1″ x 9″, to which all rafters must be well nailed.

Flooring: — All floors in first and second stories to be Georgia pine, ⅞″ x 3″. Floors in cellar and attic to be of merchantable white-pine 1″ by not over 9″. All to be free from all defects, and well nailed. Flooring of first and second stories to be tongued, grooved, and blind-nailed, properly smoothed off at completion of the building. Hard-wood saddles to be placed at all doors. Flooring throughout to finish snug to outside sheathing and partition-studs.

Stairs: — Put up stairs from first to attic story as per plan and details, risers ⅞″, treads 1¼″, to be built on strong timber carriages, and enclosed in first story as shown, with milled and beaded white-pine boards. The newels, rail, casings, all to be turned, beaded, and moulded, securely placed, and to be of Georgia pine; seat to be placed at start, as indicated.

Cellar stairs, outside and inside, to have 2″ treads resting upon 2″ x 12″ strings. Outside stairs to have inclining doors upon proper timber cheeks. Doors made of milled pine plank, with battens, and hung with wrought-iron strap-hinges, with staple and padlock.

Exterior: — The entire exterior of framework, including the roof, to be covered with hemlock boards 1″ thick, put diagonally, and well nailed to each piece of framing.

First story to be covered with weather-boards, of white-pine, 1¼″

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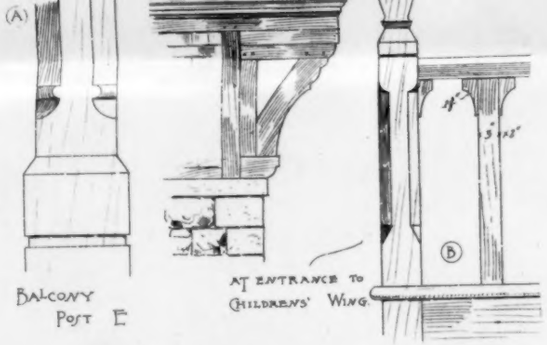

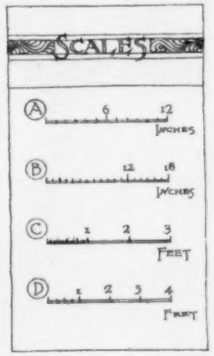

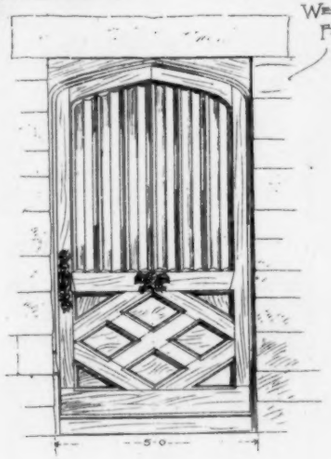

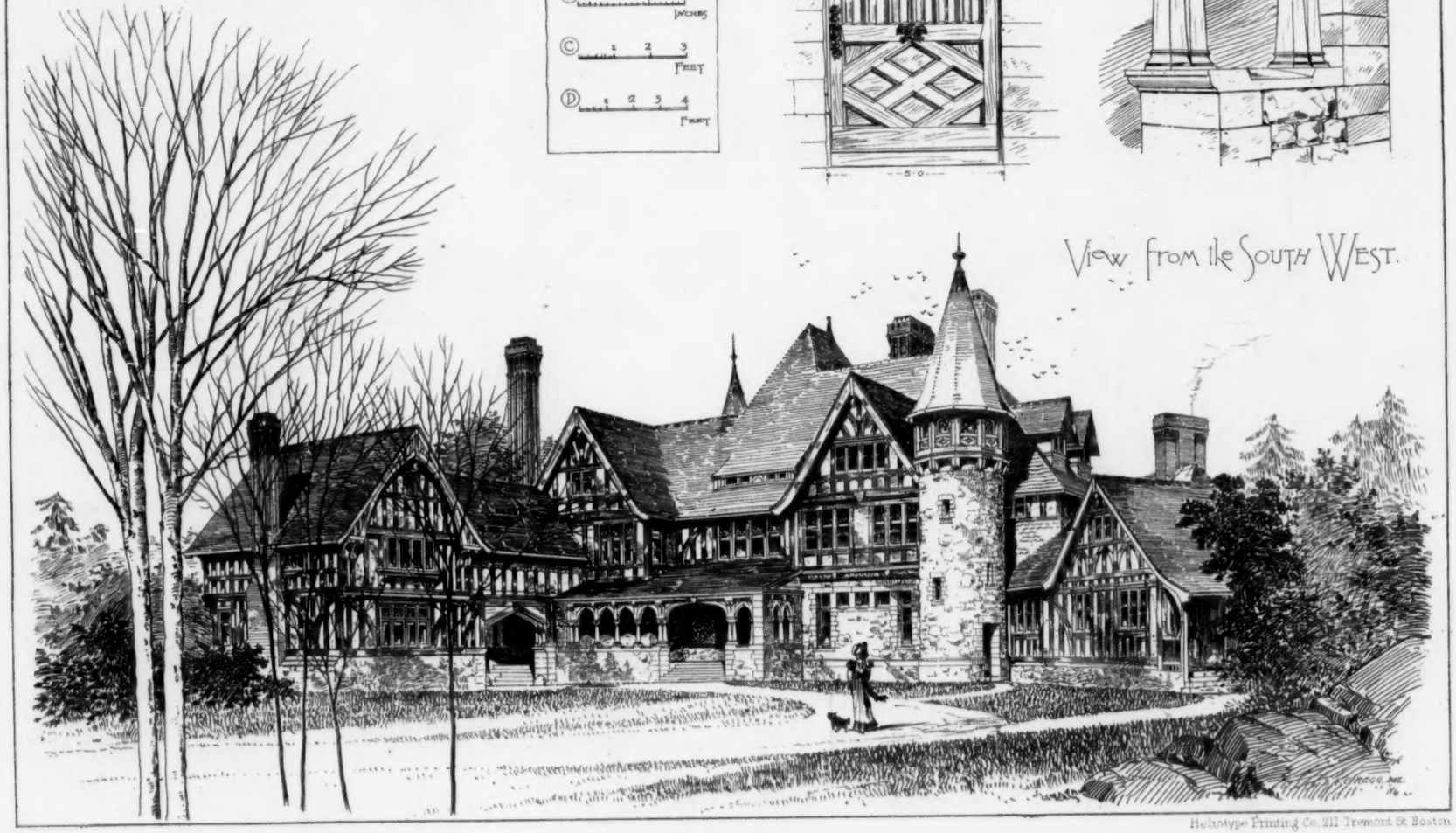

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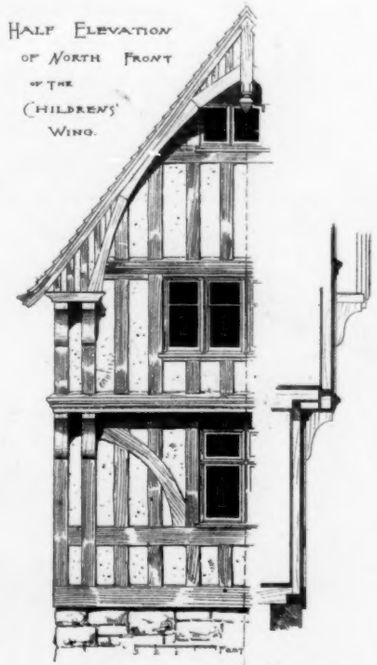
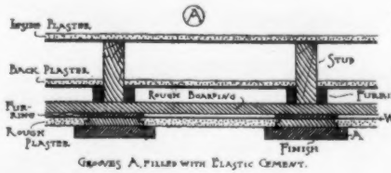


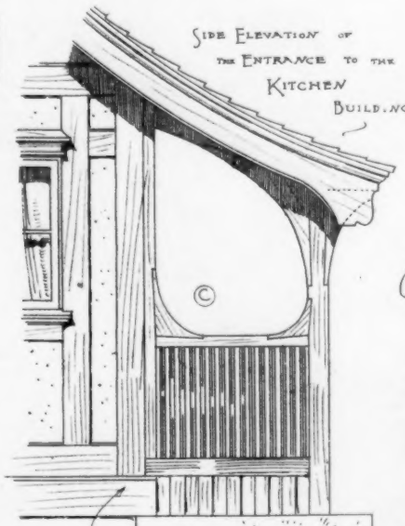
HALF ELEVATION OF NORTH FRONT OF THE CHILDRENS' WING.

SECTION



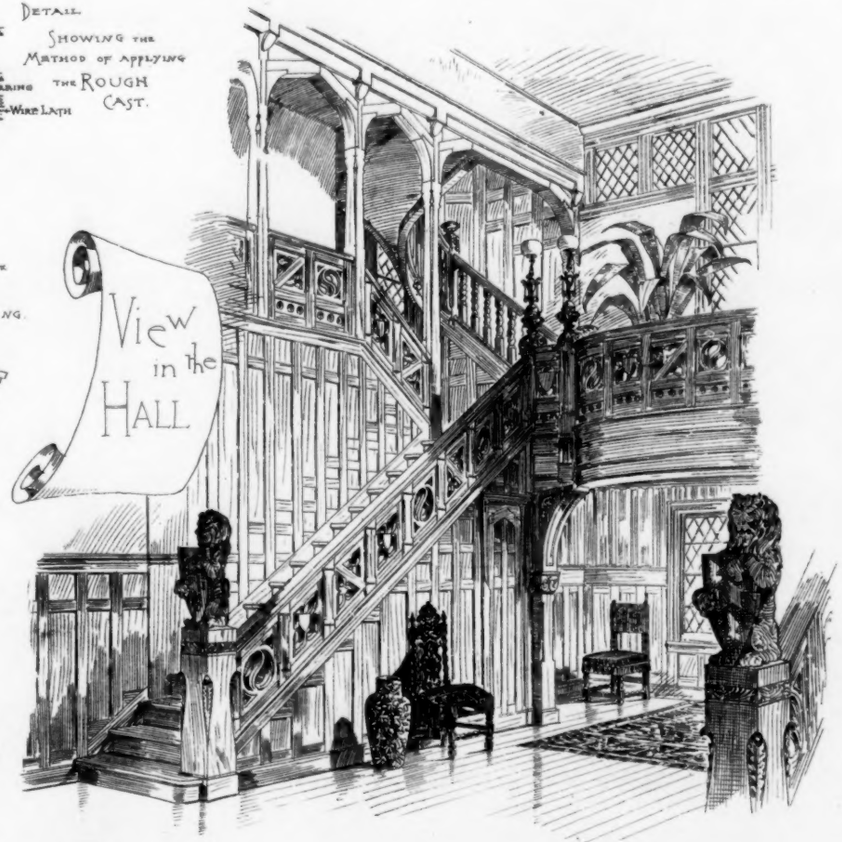
DETAIL SHOWING THE METHOD OF APPLYING THE ROUGH CAST.

GROOVES A. FILLED WITH ELASTIC CEMENT.

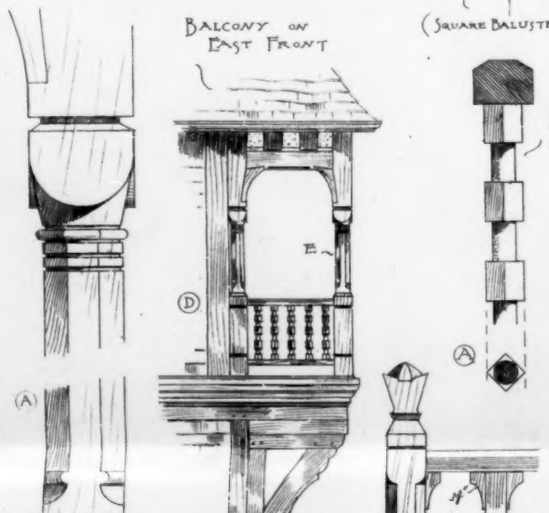


SIDE ELEVATION OF THE ENTRANCE TO THE KITCHEN BUILDING.

(SQUARE BALUSTERS WITH THE CORNERS SET OUT)

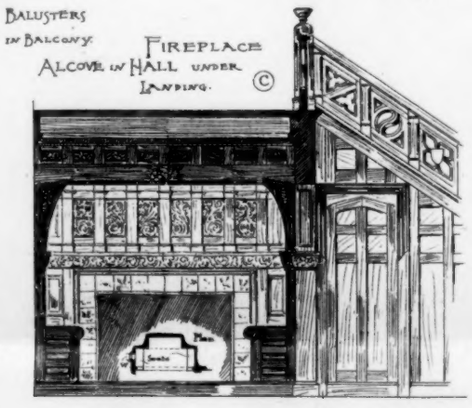


View in the Hall



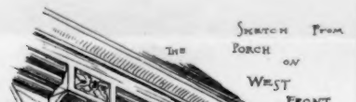
BALCONY ON EAST FRONT

BALUSTERS IN BALCONY



FIREPLACE ALCOVE IN HALL UNDER LANDING.

"CHATWOLD"
MT. DESERT, MAINE.
MESSRS. ROTCH & TILDEN, Architects.
BOSTON, MASS.



ENTRANCE DOOR ON

SKETCH FROM THE PORCH ON WEST FRONT

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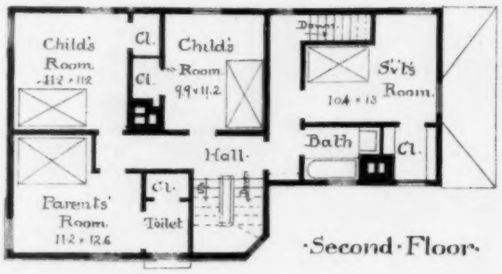
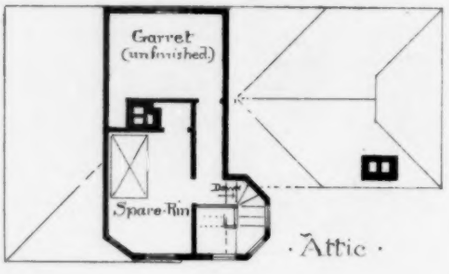


·Second·Floor·



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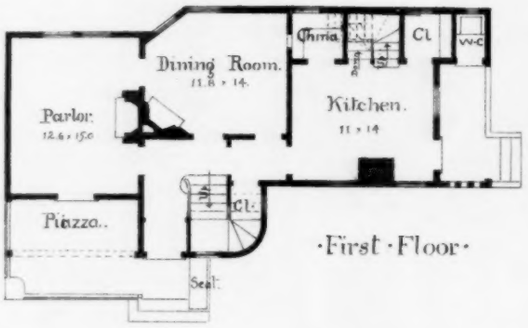
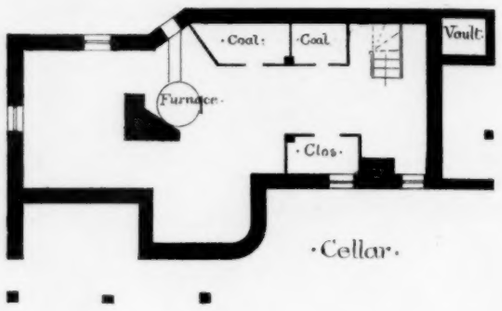


·First·Floor·



·Cellar·

Heliotype Printing Co. 211 Tremont St. Boston.

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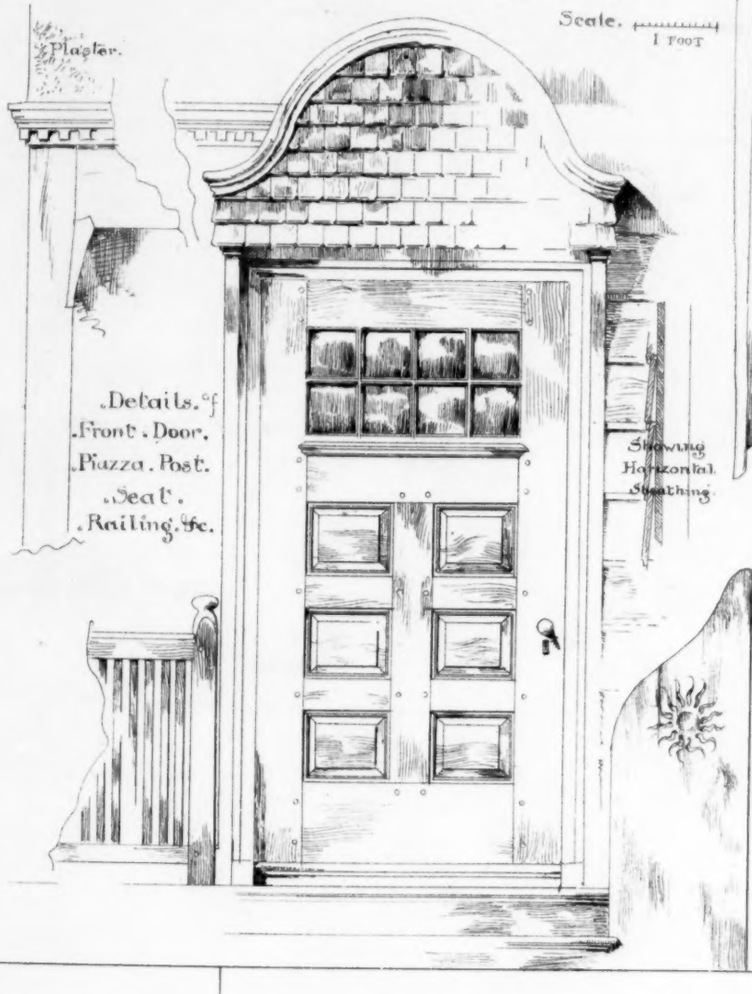
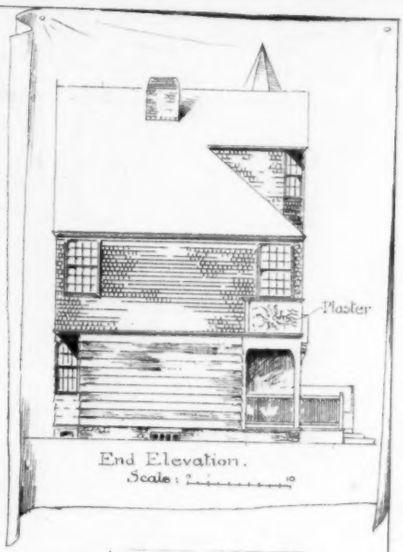
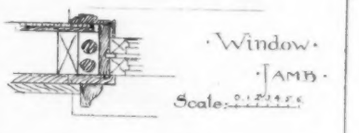
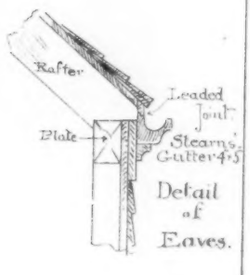
· EXTERIOR · DETAILS ·

Scale. 1 FOOT









· INTERIOR · DETAILS ·

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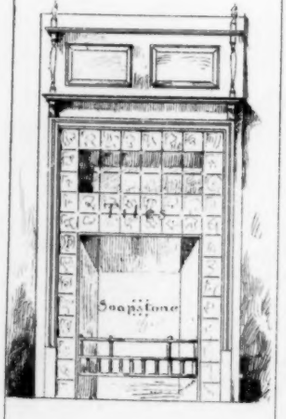
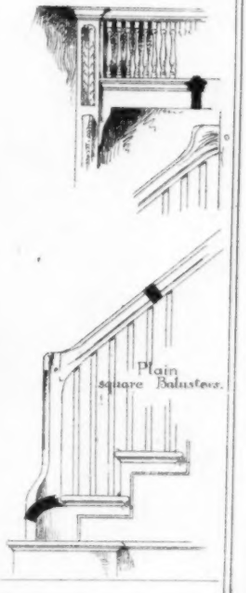


· Dining · Room ·
· Fireplace ·

View of Staircase.



· Bumpkin ·
W. E. CHAMBERLIN

Rockwell Printing Co. 107 Franklin St. Boston

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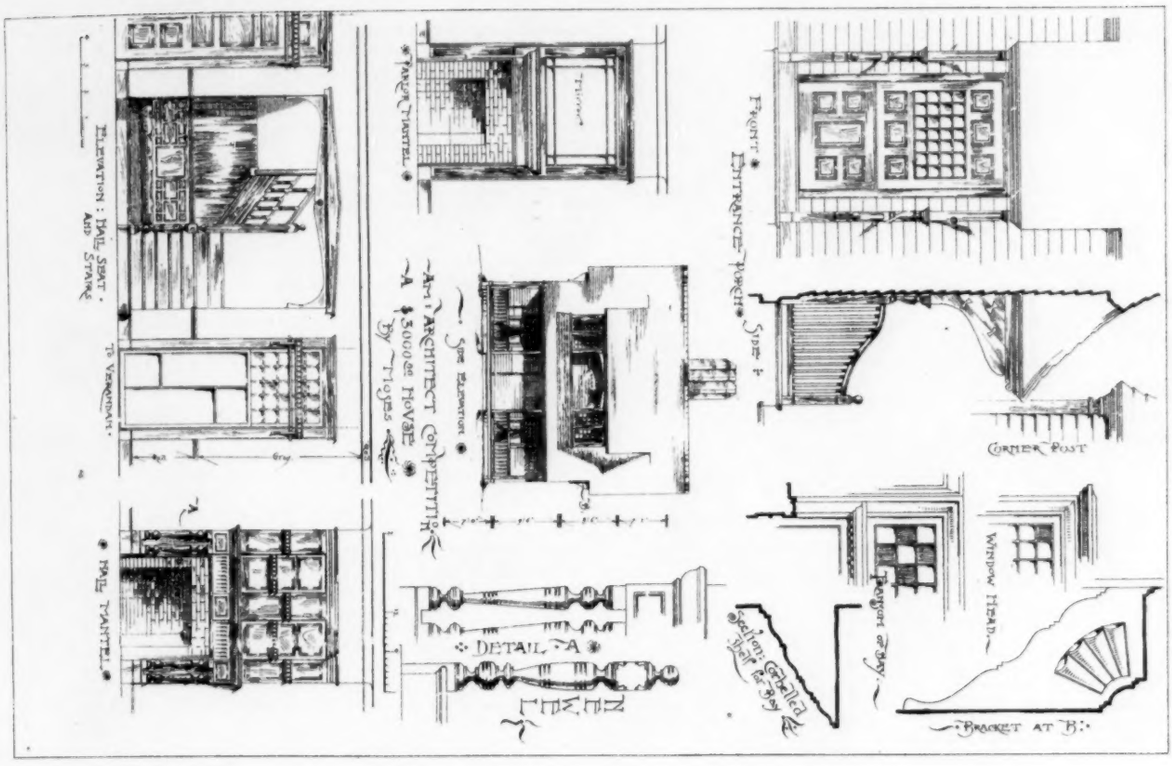

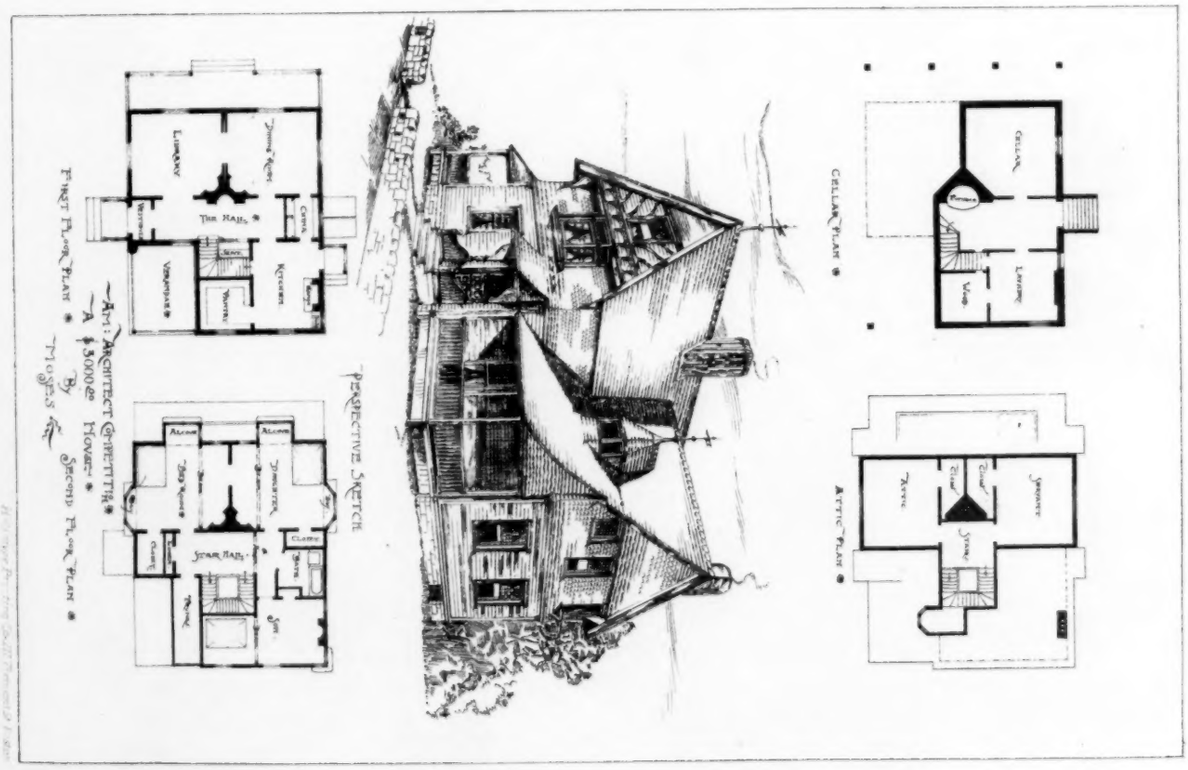

lap. The second story and roof to be covered with cedar shingles. On second story and attic the butts of shingles to be cut in wavy lines, as indicated in design. Shingles to be dipped in red paint before being placed.

Corner boards, outside casings of doors and windows, belt-bands, and mouldings with divisions, barge-boards, etc., to be of white-pine, 1½″ thick, with the water-table, to be according to sizes and designs indicated.

Verandas, steps and porches to be made as per detail, to rest upon proper posts. All projecting rafters to be planed. Put up rails, newels and balusters. Ceiling of porch and verandas, and all projections of roofs, etc., to be covered with planed, beaded, tongued and grooved white-pine boards, ⅝″ thick.

Doors, Sashes, and Frames: — All doors for interior to be 1¾″ thick, excepting attic, which are to be 1¼″ thick. Outside doors to be 2″ thick, to be panelled as shown, two divisions in height, each to be hung separately with wrought-iron hinges. The sizes of doors to be taken from drawings, and panelled as shown in design.

All sashes to be 1½″ thick, hung with cords, axle-pulleys, and weights, with box-frames. Cellar sashes hung with butts, and to have iron buttons to each, with hooks to keep them open or closed. All sashes made of white-pine of design shown.

Mantels: — Furnish and set six pine mantels, not to exceed in cost $180.00.

Inside Finish: — All doors and windows in first and second stories to have architraves, brackets and curtain-rods, shelf over as indicated, with plinth-blocks and skirting, all of best clear white-pine, neatly cut, beaded and moulded as shown. Closets to be fitted up with shelves and brass hanging hooks.

Locks, etc.: — All locks in first and second story to be 4″ mortise-locks; outside doors and door to cellar to have bolts, two to each door. To have brass knobs and plates. All other doors to have rim-locks and porcelain knobs. All windows in first and second stories to have patent sash-fasteners. All locks to have duplicate keys.

Tinning and Shingling: — The gutters on roof to be formed with boards on edge, properly graded, and to be lined with I. C. charcoal tin extending 12″ under shingles, properly graded to outlets. Put up tin flashings around chimneys, and in all valleys. To have 4″ tin leaders from all roofs, and closed balcony connecting with 5″ earthenware drain-pipe, to extend to cistern. The leaders to be properly secured to roof with wrought-iron scroll hooks.

The roof covered as above, with dipped shingles, and the ridges capped with simple crest. The front gable and octagonal dormer to have finial, and iron rod and vane.

Bath-room: — Enclose the bath-tub and basin with narrow milled-and-beaded clear ash boards. Wash-basin to have door underneath, with brass hinges and bolt. Wainscot to extend all round room, to height of 2′ 0″ above bath-tub. Provide double lid and riser to water-closet, all to be of ash, and capped with neat B. W. roll cap.

Inside Blinds: — All windows of first and second floors to have inside shutters, 1¼″ thick, of ash, to be hung two flaps in height, each flap in two panels, to have movable slats, transverse bar in centre of each panel; each blind to be cut, rebated and all closely fitted and hung.

Painting: — All the inside work, and outside work, to have two good coats of best American white-lead and oil-paint, as directed by the architect. Tin-work to have two coats, underside to be painted before it is put on. The wood-work to be painted in two colors. The shingles of second story and roof to be painted a light brick color. The outside work and trimmings in two shades of olive.

The stairs to be oiled two coats, and rubbed smooth and dry.

All the work to be thoroughly sand-papered. All nail-holes and other imperfections puttied and shellacked before painting. Should the owner desire, the trim of the various rooms to be oiled, shellacked or stained, instead of painted.

Glazing: — Glaze all the windows throughout with a good quality of American glass, excepting lower sashes of Dining-room and Library, which are to be single-thick plate. The upper sashes of Library and Hall windows to be glazed with cathedral glass. Panel of front door also glazed with cathedral glass.

All this work left clean and perfect, and finally finish and complete all the work to the full and true meaning of the plans and specifications, and remove all dirt and rubbish from the premises at the completion of the building.

ESTIMATE OF QUANTITIES AND PRICES RULING NEAR BROOKLYN, N. Y.

Estimate for building a frame house, according to plans and specifications submitted by "*Moses.*"

Copy of estimate received:—

MASON'S WORK.

Excavation, etc., 130 cu. yds., @ 25c.	$32.50
Stone-work, 65 perch, @ $3	195.00
Brickwork, 94 M., @ $13	123.50
Plastering, 590 sq. yds., @ 25c.	140.00
Total	$491.00

CARPENTER'S WORK.

7,500 ft. studding and framing, @ 2c.	$150.00
3,200 ft. sheathing, @ 2c.	64.00
3,720 ft. shingles	130.00
1,500 ft. weather-boards, @ 3c.	45.00
2,400 ft. Georgia pine flooring, @ 3c.	72.00
1,100 ft. Georgia pine flooring, @ 2c.	22.00
Sash, doors, interior and exterior trimmings and mantels	$1,000.00
Hardware, nails, etc.	150.00
Tinning	25.00
Stairs	110.00
Plumbing	125.00
Bells	30.00
Painting	380.00
Total	$2,303.00
Mason's work	$ 491.00
Carpenter's work	2,303.00
	$2,794.00
Architect's fee, @ 7 %	195.58
Total	$2,989.58
Appropriation	$3,000.00
Contingent	$10.42

[PRIZE] DESIGN SUBMITTED BY "*Bumpkin.*"

"*BUMPKIN'S*" house is supposed to be built in Allston, Mass., near Boston. Labor is as cheap there as anywhere. The Boston market is at hand, railroad accommodation easy, and stone-work cheap.

The cellar walls are of 18-inch rough stone up to grade, and then 18-inch brick wall up to sill.

Walls of first story covered with pine "siding," broad horizontal sheathing 10 inches wide, lapped as shown in detail-drawing.

Above second-story floor-beams shingles everywhere, *left untouched* by paint or stain, to become gray with time.

Rough boarding and lower floors of hemlock. Frame of spruce. Plaster, two-coat work. No wainscoting nor hard-wood finish. Mill windows and doors. Stearns's cypress gutters.

Sizes: — Sills, 4″ x 6″; plates, 4″ x 6″: wall-studs, 2″ x 4″, 16″ on centres; partition-studs, 2″ x 3″, 16″ on centres; first-floor beams, 2″ x 9″; second-floor beams, 2″ x 10″ (the reason for this is that the second story projects in two places, and has many unsupported partitions to carry); third-floor beams, 2″ x 8″; rafters, 2″ x 8″.

ESTIMATE OF QUANTITIES AND PRICES RULING AT ALLSTON, MASS.

The following estimate is based on figures obtained from one of the most reliable builders in Boston.

Except for stone and brick work, the prices quoted for material are *cost* prices, not counting labor nor builder's profit, which will be found added-in at the end.

On the lower floor, without including piazzas, there are 817 sq. ft.; at $3.50 per sq. ft., the house would cost $2,859.50. This, with piazza-work and the architect's commission, would bring the figure very near the $3,055.55, as computed.

"*Bumpkin.*"

Excavation, 5,500 cu. ft. = 204 cu. yds., @ 22c.	$44.88
Cellar Wall (stone) 40 perch; @ $3.50, (laid)	140.00
Brick Foundation (8″ thick) with vault, piazza piers, and 2 cellar piers, 158 cu. ft. (24 bricks to a foot); 3,792 bricks, @ $20 (laid)	75.84
Chimneys, 9,380 bricks, at $20 (laid)	187.60
Frame. sq. ft.	
Sills, plates, outer walls, and inner partitions	2,790
First floor	1,288
Second floor	1,480
Third floor	300
Second-floor ceiling-joists	648
Attic ceiling-joists	220
Roof	1,166
Total, @ $16	7,892 — 126.27
Rough Outside Boarding. sq. ft.	
First floor	1,311
Second floor	1,197
Third floor	384
Roof	1,405
	4,297
Outs, Windows.	
First floor, 14	
Second " 12	
Third " 4	
30 @ 22 sq. ft. =	660
Total, @ $13	3,637 — 47.28
Rough Lower Floors. sq. ft.	
First floor	608
Second floor	700
Attic	250
Total, @ $13	1,558 — 20.25
Outer Covering. sq. ft.	
First floor, siding, @ $30	964 — 28.92
Second floor, shingles	816
Third and gables, shingles	424
Roof	1,405
Total	2,645
120 ft. to 1,000 shingles. 22 M., @ $3.75	82.50

Windows, 24 large, including sash, glazing, weights, line, sash-fast, frame architraves, and blinds, @ $5.50	$132.00
7 small ones, @ $3.25	22.75
Doors, 28, including hardware, thresholds and architraves, @ $6.50	182.00
Stairs, all told	140.00
Nails	35.00
Upper floors, 1,611 ft., @ $30 (None in garret.)	48.33
Plaster (including lathing). *Walls.* sq. ft.	
First floor	2,473
Second floor	3,362
Third floor	712
Total	6,537
Outs. sq. ft.	
Lower floor, 3 outer doors	85
" " 11 inside doors,	484
" " 13 windows	195
Second " 10 doors	440
" " 12 windows	180
Third " 3 doors	132
" " 3 windows	45
6,537 — 1,561 = 4,976 sq. ft. = 553 sq. yds., @ $.18	99.54
Ceilings	30.25
Plumbing (bath-room and sink only)	150.00
Gutters, 75 ft., @ $.12	9.00
Conductors, 60 ft., @ $.10	6.00
Plaster band on exterior (architect to do the "scratch-work")	8.00
Furnace	150.00
Painting (on outside, the lower story and all mouldings will be painted; shingles left as put on)	125.00
Labor	700.00
Two fireplaces (owner already has tiles)	50.00
Total	$2,641.41
Builder's profit, 10 %	264.14
Architect's commission, 5 %	150.00
Other expenses	150.00
Total	$3,055.55

THE ILLUSTRATIONS.

"CHATWOLD," MOUNT DESERT, ME. MESSRS. ROTCH & TILDEN, ARCHITECTS, BOSTON, MASS.

THE house is situated upon a sheltered cove surrounded by woods, the pines growing to the edge of the rocky shore. The architectural treatment is intended to be bold and rugged. The first story is of rough brown granite with red-granite finish, quarried from ledges upon the place, and set to show weather-worn faces. The round tower is built of red granite boulders. The roofs are shingled, and the second story and wings of half-timbering and rough-cast. The timbering shows the hewn surfaces of hand labor, and

the interior finish is of coarse-grained hard-woods treated with dark stains, and with few mouldings. This severity is relieved by a few points of rich carving.

COMPETITIVE DESIGNS FOR A $3,000-HOUSE, SUBMITTED BY "*Bumpkin*" [MR. W. E. CHAMBERLIN, CAMBRIDGEPORT, MASS], AND "*Moses*."

SHOULD any of our non-professional readers desire to build according to either of these designs, we trust he will do the author the simple justice of putting the work into his hands. We shall always be pleased to put client and author into communication with each other.

RAMBLING SKETCHES, BY MR. T. RAFFLES DAVISON. — BENCH-ENDS, FROM REVELSTOKE.

[From the *British Architect*.]

[In consequence of the printer's negligence we were unable to publish the following description in our last issue.]

FEW more sumptuously-appointed churches exist than this of St. Peter's at Revelstoke, in Devonshire, for it contains no less than a hundred differently carved bench-ends as elaborate as these, whilst the rest of the building is as ornate as sculptured angels, carved bosses, wall-plates, purlins, and ribs can make it. The walls are largely of granite, and are lined in the chancel with an inlaid marble dado and delicately carved oak wainscoting above: this part of the work, including the reredos and stall-ends, being a splendid record of the carver's art in the nineteenth century. In fact I think the reader will agree with me, from the specimens illustrated, that the bench-ends are excellently designed, and form a very good show of what our modern workmen are capable of at their best. Mr. J. P. St. Aubyn, the architect, and his wealthy client must be more than satisfied with the result of the expenditure in carving.

There seem to me in these two examples two types of good work: in the figure of Christ in the seamless robe, of regal dignity; and in the angel panel, of beauty in line and form. Judging from the examples perpetrated, I should say it is not usually easy to make a good angel; but Mr. Hems must get them direct from heaven. Perhaps after all it is a tribute to Devonshire girls, who serve as unconscious models of a refined and simple beauty exactly suited to the purpose. For a small figure I do not remember seeing a representation of Christ with more of divine dignity in modelling and attitude; an excellent figure it would make for a pulpit panel, where folk could see it better than low down in an aisle.

If you have read these notes you may feel some wonder as to how in a remote and poor district, on the sea-coast of Devonshire, it is possible to put up such costly work, for our carvers, as every one knows, like to be very well paid for their labor. The inhabitants are chiefly fisherfolk, and live in a primitive way, not much affected by the deceitfulness of riches. They are indebted to Mr. E. P. Baring, the well-known banker, who is the resident lord-of-the-manor, for building a new church on a new site, above the precipitous banks of the Yealm. The old church stood for ten centuries on the sea-coast quite a mile from the hamlet, and to go that distance and face the wild sea-shore in bad weather was more than many of the old folk could manage, therefore Mr. Baring's gift is one of real benefit. The church has been built without the help of a contractor, but fortunately did not want for an experienced architect, the well-known name of Mr. James Piers St. Aubyn bearing the credit of the design, whilst it was carried out under the personal care of Mr. G. W. Crosbie, the estate clerk-of-works. The work is all very solidly and well executed, with much of the ring of "old work" about it.

THE AMERICAN ARCHITECT COMPETITIONS.

THE AWARD.

AFTER a careful consideration of the large number of drawings submitted for the $3,000-house, the jury awards the three equal prizes of $75 each to the authors of the following designs:

"*Bumpkin*." Mr. W. E. Chamberlin, Cambridgeport, Mass. Cost, $3,055.55.

"*Danfors*." Mr. Sanford Phipps, Boston, Mass., Cost, $3,343.20.

"*B. S. S.*" Mr. A. W. Cobb, Boston, Mass. Cost, $3,146.00.

We will add that a very satisfactory number of persons have applied to us for the names and addresses of the authors of the designs which have already been published in the *American Architect*, from which it may justly be inferred that even the unsuccessful competitors are likely to reap a considerable benefit from their efforts. To save ourselves the trouble of answering similar inquiries we would like to publish with the remaining drawings of the series the names and addresses of their respective authors; but as some may object to have their names associated with an unsuccessful effort we beg that any competitor who feels any such disinclination will at once notify us to that effect, so that we may publish his design over his *nom de plume* only, and furnish his name and address, privately, to such persons as may be inclined to avail themselves of his services.

THE NEXT COMPETITIONS. — MECHANICS' HOUSES.

JUDGING from the remarks of the daily press throughout the country, our recent competition for a $3,000-house has attracted a good deal of attention and favorable comment, and we are strengthened in our belief that one way to justify, in the eyes of the people, the existence of the architectural profession is to show that its members can and will exert their talents for the poor as well as for the rich. We therefore announce the two following competitions, first referring intending competitors to the regulations which govern these competitions, published in our issue for December 23, 1882: —

PROGRAMMES.

I. Our last competition provided for the wants of a man whose income was about five dollars per diem; in the present one we would like to have the competitors turn their attention to a house for a mechanic living on a daily wage of three dollars, who can afford to build only by joining a "building association," or by mortgaging his proposed house, and who, even under such circumstances, ought not to attempt to build a house costing more than $1,500. As it may be fair to suppose that this mechanic and his family are more hardy than more fortunate individuals who enjoy a larger income, he might elect to build, for perpetual occupancy, such a house as the more wealthy would build only for summer use.

The chief essentials in designing such a house are space, good construction, and a careful regard of the limit of expense. The conditions of the present competition are simply that the proposed house shall contain at least six rooms, and shall approximate in cost $1,500. Open fireplaces, bath-rooms, water-closets, furnaces, etc., are to be held as luxuries and not essentials.

Required. A pen-and-ink drawing containing a perspective view of the exterior, plans of both floors and an elevation of one of the sides not shown in the perspective; also as many details as possible. The drawing may measure 14″ x 22″ or 21″ x 33″, to suit the convenience of the designer.

Also, a short reading description, [not a specification] explaining what steps have been taken to keep the cost within the prescribed limit, and a detailed bill of quantities and prices carefully arranged and classified [a great improvement in this respect can be made over many of the schedules furnished in the former competition]. Each competitor is required to obtain an estimate on his design from a trustworthy builder, and furnish the name and address of such builder for publication with the estimate.

For each of the three designs of highest merit a prize of $50 will be paid. No design will be published in the "*American Architect*" previous to the award of the jury, in order that each competitor may have the benefit of the publication of his name and address with his design if he so desires.

Drawings are to be received at the office of the *American Architect*, 211 Tremont Street, Boston, on or before Saturday, April 21.

II. It is possible that two mechanics would perceive the possibility of securing a more commodious habitation by clubbing their purses, and building a double tenement under a common roof. In such a case each tenement might be treated as a distinct dwelling, or it would be fair to suppose that the two mechanics were brothers or intimate friends whose families could live in harmony, and could make use of certain rooms and conveniences in common, as for instance, the kitchen, the dining-room, or a larger parlor in addition to the usual living-rooms of each house. Any competitor who attempts to work out this phase of the problem must take care to keep the privacy of the two dwellings in all other respects well marked. Building thus under one roof, and on a common foundation, each mechanic might expect to obtain a larger dwelling, having at least seven rooms, without materially increasing their combined expenditure, which the competitors must try and keep within $3,000.

Required. A pen-and-ink drawing 22″ x 30″ containing a perspective view; plans of both floors, and an elevation of one side not shown in the view; framing plans at a small scale and all necessary details.

Also, a short skeleton specification, a detailed bill of quantities and prices, and a tender from some reputable builder, name and address being furnished for publication.

For the best designs in the order of their excellence will be awarded prizes of $100, $75 and $50 respectively.

Drawings must be received at the office of the *American Architect* on or before Saturday, May 19, next.

THE $3,000-HOUSE COMPETITION.

PHILADELPHIA, February 14, 1883.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Gentlemen, — In the criticisms of plans and specifications for a three-thousand-dollar house no allusion has been made to omissions that would prevent the occupancy of such a building if erected as specified. The most serious omission occurs in the specifications and estimates submitted by "*Maximum*," in which no provision has been made for the main stairs. While endeavoring to secure the minimum in estimated cost, the maximum has been certainly acquired in erroneous omissions. Considering the large number of unprofessional readers who are likely to be misled, it would be well for competitors to thoroughly review their plans and specifications, or to so qualify that omissions could readily be provided for. Under no circumstances could a builder be compelled to construct a stairway uncalled for in

the specifications, and his refusal would immediately cause unpleasant relations between the architect, owner, and builder.

Yours, SUBSCRIBER.

[MOST of the competitors, and "*Maximum*" among them, have given to their "skeleton specifications" more substantiality than the programme actually called for, so that the omission of staircases in the specification need not necessarily lay the author open to criticism any more than the omission of any of the other innumerable things that are usually incorporated in a complete specification, but have been omitted from these "skeletons." Moreover, as the drawings form part and parcel of the contract, and the stairs are thereon indicated, and as there is probably ample material for the construction of the stairs included in the lumber called for by the bill of quantities, "*Maximum*" need not fear that he would not be able to compel the builder who undertook the work to build the stairs, though he probably could not compel him to furnish any but the commonest hand-rail, posts, etc. — EDS. AMERICAN ARCHITECT.]

"BUILDING SUPERINTENDENCE."

SURVEYOR'S OFFICE, BOSTON, February 9, 1883.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — According to your description of finding stress for roof of Figure 180, "Building Superintendence," XXVI, I find that the king-rod stress is 8,000 lbs., instead of 6,000 lbs., and the strut 4,600 lbs., instead of 3,600 lbs.

The portion of description on wind-pressure is not clear to me, and certain figures and letters are wanting in diagram.

Very respectfully, GEO. F. LORING.

[MR. LORING'S comments are probably quite correct. The sketch of the truss was not drawn to a scale, and the dimensions, as well as the angle of the rafter, were only approximated in the description. The stress-diagram was also drawn at a very small scale — 5,000 lbs. to the inch — to allow of its being successfully photographed. Under these circumstances it is not surprising that his results differ from mine; and so long as the principle is correct, it is not important. For the wind-pressure diagram, however, an apology is certainly due and a better one has already been prepared for use in its place. — T. M. CLARK.]

"CONVENIENT SCALE."

PHILADELPHIA, February 8, 1883.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — Please give me an inkling as to the meaning of any "convenient scale" mentioned by Trautwine to be used in finding strains, *vide* cut-trusses, p. 247, notes to Figure 5. Am I to understand that by the term "convenient scale" he means the scale of feet employed in making the diagram, and that each division of the scale representing feet equals tons or number of pounds?

By replying to the above in the next issue you will greatly oblige

A STUDENT.

[The "convenient scale" may be, say, 1000, 2000, or 3000 *pounds* to the inch. It has nothing to do with the scale of the diagram. If "Student" will look again at the figure in Trautwine, he will see that for measuring the strains, the weight of half the truss and its load may be represented by any part of the vertical line shown, and that by following the directions for the remainder of the process, the oblique and horizontal strains will be measured by the same scale, whatever it may be. — EDS. AMERICAN ARCHITECT.]

BOOKS.

TOPEKA, KAN., February 14, 1883.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Sirs, — I am a subscriber to your valuable paper, and have been for years; this is supposed to give me the right to bore the editor. But seriously, I wish information which I do not know how to obtain otherwise.

I wish to post myself thoroughly upon the domestic architecture of the wide, wide world. I don't know how near I can get to this point — don't know that I can afford to do all this, even if I knew how; but I apprehend you can give me a list of the books I should need to purchase in order to skirmish about the edges of a topic so large; if not of the whole world, then part. I wish to reach the domestic life of the rural classes in particular. This includes houses, barns, habits, etc., with schools and churches, as far as practicable.

I can, if I need to, pay for a half-dozen ordinary books, and more if I must, to make the information perfect. I would particularly like to get at representative facts. I cannot use other than English works, or rather works in English. This doubtless limits me, but I cannot help it. If the giving of this information usually brings with it a fee for the pains, please let me know and I will remit. I would like to have names of authors, publishers and prices.

I do not want American domestic life — I know that already — but English, and Continental Europe, both northern, middle and southern, as fully as possible, and as much over into Asia and Africa as I can secure. I hope I have made myself understood. I shall feel very thankful for a careful reply.

Very truly, J. G. HASKELL.

[READ, for a beginning, Viollet-le-Duc's "Habitations of Man in all Ages," translated by Bucknall; published by James R. Osgood & Co., price, $2.00. Then take up Kerr's "The Gentleman's House," to be had of J. Sabin & Sons, New York, or Estes & Lauriat, Boston, for four or five dollars, or more, according to condition; and continue with Nash's "Mansions of England," small edition, same dealers, $25; Richardson's "Studies from Old English Mansions," same, about $1.00; and consult Cicognara's "Venetian Architecture," Letarouilly's "Edifices de Rome Moderne," Sir William Gell's "Pompeii," and an infinity of other costly books, to be found in most large libraries, for illustrations and details. Viollet-le-Duc's "Dictionnaire Raisonnée," Article "*Maison*," contains invaluable information. Besides these strictly technical works, many picturesque books of travel — "Picturesque Europe," for instance — contain hints which can be used by one who understands what he wants, and any good Dictionary of Antiquities, such as Smith's, gives available information in regard to Greek and Roman dwellings. — EDS. AMERICAN ARCHITECT.]

CALCULATING STRUCTURES.

CHICAGO, February 15, 1883.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Will you please let me know through your valuable paper the best way to become master in calculating any kind of architectural structures. I am hardly able to visit a college (none of the kind is in this city) and it would cost me too much to go abroad.

Very respectfully,

A SUBSCRIBER.

[LEARN *thoroughly* algebra, geometry, trigonometry, descriptive geometry, analytic geometry, calculus, and applied mechanics, to get the theory, and then try to get a position in the office of a constructing engineer to learn practice. — EDS. AMERICAN ARCHITECT.]

A QUESTION OF FEE.

CHARLESTON, S. C., February 21, 1883.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Some time ago I was requested by a "building committee" to visit their town, examine a lot upon which it was proposed to erect a public building to cost $12,000, and also to make sketches for them of a suitable structure, to get, as it were, "their ideas into shape." They stated that they would pay my "expenses and charges." I propose to charge a per diem in addition to my travelling expenses, for such time as I was out of the city, but do not know what to charge for the sketches. If there is any established practice, will you be so kind as to inform me.

"SUBSCRIBER."

[ONE per cent on the proposed cost is the usual charge for preliminary sketches. — EDS. AMERICAN ARCHITECT.]

THE HEAD-DRESS OF THE STATUE OF LIBERTY.

February 25, 1883.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Sirs, — In your last issue you quote from the New York *Times* Mr. Jefferson Davis's account of how the head-dress of the Statue of Liberty, at Washington, came to be changed.

The story is correct enough, except the very important fact that it was Thomas Crawford, not Hiram Powers, who modelled the statue. Mr. Crawford, who told the writer the story, understood the question of *slavery* to be at the bottom of Mr. Davis's objection to a liberty cap. He did not want to see the badge of *emancipation* on the Capitol.

Mr. Crawford's early death prevented his superintending the casting in bronze of the statue, which was carried out by Clark Mills, in 1863.

The *Evening Post* and New York *Daily Graphic* have published corrections of this story, but I see it floating around the country in its original form. It is simply an error of memory on the part of Mr. Davis. Yours respectfully, CHAS. H. WARD.

HINTS FOR IMPROVING THE BUILDING LAWS. — A PERSONAL EXPERIENCE.

NEW YORK, February 19, 1883.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Sirs, — As member of a Committee of Architects acting officially with the Building Bureau of the Fire Department in the case of unsafe buildings, I attended on Wednesday afternoon, 31st ult., a conference between the Mayor of this city, the chief of the Building Bureau, and a number of gentlemen connected with building interests. It was held to consider certain proposed amendments to the Building Law, having reference, among other points, to the greater security from fire of our modern many-storied buildings.

Quarter of an hour after, I was fleeing, at a moments' warning, with all the agility my not over limber legs could muster, up the two flights of stairs, already in flames, to the roof of the Moffat Building, corner of Broadway and Worth Streets, having long ago decided that means of egress to afford the likeliest chance of escape in case of the calamity now upon me. Reaching, with others, that temporary haven, I luckily found a ladder, simply a wooden movable one, however, though placed there mainly for just such an emergency, which conveyed me, — without the necessity of a leap that might have broken my legs, or at least sprained my ankle, and made further locomotion difficult—to the roof of the next building. But that ladder had been removed when a few minutes after, a sick woman and a child were dragged out through a window,—through which dense volumes of black smoke were pouring — barely in time to escape the tongues of flame that pursued them. There were willing hands, however, to aid them, and they were pulled through safely, but at the imminent risk of their lives, and only to encounter fresh danger from the mid-winter weather; for there had been no time for the sick mother, the

janitor's wife, to gather up so much as a shawl for herself or her little boy.

Meanwhile, there was immediate danger of the buildings we were on, with the roofs of the whole block down to Church Street, catching fire from the burning structure, for there had been some little delay in sending out the alarm to the Fire Department; I was consequently seeking some means of escape to the street. With others I pounded and stamped on one skylight and scuttle after another without effect, the attic floor of mercantile buildings being, I suppose, like that of most others, generally deserted, at least in the daytime; while the heads of the occupants of every story below were probably, as usual under such circumstances, poked out of windows on the lookout for danger to themselves, and so beyond the reach of hearing sounds from within. I should add that in the passage from one roof to another I had to do much clambering and jumping in connection with the topping-out walls that divide the roofs of the various buildings in the block; performances easy enough for any lithe and supple youth, or for the stalwart and alert firemen, long accustomed to the work they do so well and bravely, but hardly to be expected from delicate women and little children, and by no means conducive to the peace of mind of no longer youthful heavy-weights conscientiously intent on getting themselves and others out of the way of a fire close behind. I did not, I assure you, cut all my involuntary pigeon-wings without the obliging assistance of the younger and lighter sort.

This fire, and still more the deluge of water that quenched it, have subjected me to considerable loss and great inconvenience, but nobody has been hurt in life, or so far as I have heard in limb; so that one who found himself safe and sound after seeing but the thickness of a plank between himself and a somewhat grim and undesirable sort of death can well afford to take a Mark Tapleyan view of the situation. Nevertheless, my personal *mauvais quart d'heure* on the roofs has brought home to me certain facts, and suggested to my mind certain safeguards, which I beg to submit to you *pro bono publico*, in advance of the possible embodiment of any of them, in any improved local building laws.

During the last dozen years or so, I have, sometimes in official and sometimes in non-official coöperation with others, done a good deal of hard work both here and in Albany, towards attempting to secure the passage of a New York building law, based, not as the existing one is, on the traditions of a big village, but on the requirements of a great and growing centre of commercial and social activity, and on the exigencies of building operations, which in magnitude and in scientific desiderata, compare with the requirements of a quarter of a century ago, as one hundred units do, say, to ten. But I have learned in the effort that there is a great deal of human nature, not only in legislators, but in their expert advisers, and, without wishing to strike a pessimist note, I should say that in the matter of precautions against damage to life and property from conflagration in high buildings, it might be better for property-holders to anticipate the possible provisions than to wait for the mandates of a perfect building law.

In the first place, then, the roof of a high building being more available as a place of refuge than the street, so far as the occupants of the upper stories are concerned, let it be connected with the other adjoining roofs by means of — not movable wooden, and therefore inflammable ladders, but — stationary iron ones; or rather regular fire-escapes, which cannot be removed and will not succumb to the first action of fire. It may be said that the building laws of our various cities generally prescribe the use, wherever needed, of fire-escapes, within the discretion of the building authorities; but even if so, that does not, at least in New York, ensure those authorities any approach to an adequate force for survey, inspection, and administration. As a matter of fact, the number of fire-escapes in actual use in this city is very small compared with the number really required for safety, especially for that of women, children, and men past the period of agile movement. Let the system of stationary fire-escapes of incombustible material be extended, till the entire roof-system of every block be practically reduced to one level. As fast as the new high buildings born of the elevator system are put up, the inequalities of roof-level and their attendant danger will increase. Top-out walls, as well as enclosing ones, should, if carried up more than, say, a couple of feet, be included for the application of the escapes.

Another point: Let the scuttle of every roof in the block be provided with a bell-pull communicating with a gong on every floor beneath, so that those who escape upwards from a burning building may rouse the occupants of the one they have reached, have the scuttles opened to them, and thereby not only secure for themselves safe passage downward to the street, but give said occupants warning timely enough to enable them, perhaps, to put some of their property, as well as themselves, out of the reach of danger. If the building covers much ground, as in the case of the Moffat building, and the fire begins in the rear, as this did, the flames may make considerable headway before any one knows of the matter, even in the burning building itself, to say nothing of people in the street, or in adjoining buildings. Such was the case in this instance.

I would suggest that it might possibly be found that it would repay the Fire Insurance interest to combine for the protection, at its own expense, of insured property, in the manner above suggested. The cost of strengthening the present inadequate system — so far at least as roof-levels are concerned — of fire-escapes, and of introducing these annunciators would be the merest bagatelle compared with the difference in its favor that would presumably result from decreased expenses, and present expenses in meeting its obligations to its customers after the ravages of fire. As a parallel instance, in my own case, if it had not been for the care and appliances of the Fire Insurance Patrol the property in my quarters would have been lost and damaged to an amount probably double that which has actually occurred.

Objection may be made that the practical reduction of all the roofs of a block to a level "would make things easy for burglars." But the normal condition of a block finished *en permanence* is to have the roof-area level — or nearly so — throughout. Take nearly all the residence blocks up-town for instance; the roofs are already on a level, and so it will be down-town when the modern elevator-building has everywhere taken the place of the existing one. I fancy it would be a very high wall indeed that would stop a burglar intent on entering one of a row of buildings by the roof. Among a burglar's chosen qualifications for such a feat would, I presume, be strength and agility of body, and I suppose that grappling-hooks and ropelines and ladders are not unknown to his class. And as for the gongs to be communicated with from outside scuttles by persons on the roof fleeing from a fire, they might in fact be included in a burglar-alarm apparatus.

My experience at this fire suggested to my mind several other points of possible improvement on existing conditions of building, but they are minor ones, and I have already sufficiently trespassed on your space. Yours truly, A. J. Bloor.

NOTES AND CLIPPINGS.

Swiss Wood-carving. — The first attempt to introduce wood-carving into Berne was made half a century ago by Christian Fischer, of Brienz, who may be called the father of the art, for after acquiring it himself he taught it to others and founded a school. Besides being an artist in wood Fischer taught music, made musical-boxes, and practised the healing art, but like many other clever fellows he died in poverty. Some time after Fischer began wood-carving at Brienz a certain Peter Baumann began at Grindelwald the making of the miniature Swiss châlets which are now so popular. He afterward removed to Meyringen, where he taught his art to his three sons, one of whom, Andreas, proved to be a genius of the first order, and was equally distinguished for originality in design and skill in execution. He was the first to practise carving in relief. His roses are still regarded as masterpieces, and serve as models for young sculptors. The success of the Baumanns encouraged others to follow their example, and wood-carving soon became a winter occupation in nearly every cottage of the valley of the Hasli. But the sale of carvings and châlets being restricted to foreign tourists in the summer season, principally through the intermediary of hotel porters the trade for a long while was limited and unremunerative. But it struggled on, and in the course of time attracted the attention of local capitalists, who started workshops, opened depots for the sale of their products, and began an export trade which, with some fluctuations, goes on steadily increasing. The business of wood-carving now finds employment for several thousand individuals. In one establishment alone — that of the brothers Worth — 300 to 400 sculptors of both sexes are regularly occupied. Each has his or her specialty, the choice of which is left to individual taste. Some have an aptitude for and excel in the modelling of groups of animals; others give their attention to flowers and plants; others, again, prefer to carve ornamental caskets and build miniature châlets. The women have great delicacy of touch, and their work in certain branches is preferred to that of the men. One thing leads to another, and the abundance of certain sorts of wood in the district suggested the idea of adding to the wood-carving the production of what may be called fancy furniture — carved chairs and tables, napkin-rings, and such like articles. A factory has also been started at Interlaken, and is now in successful operation for making habitable châlets on a large scale. You have only to select your design, give the order, and all the parts of a châlet are sent to any destination, so arranged and marked that an intelligent joiner can put them together, and you have a handsome and picturesque house which you may live in as long as you like, and even carry about on your travels. Another trade which has lately sprung up in the Bernese Oberland is the making of slabs, table-tops, and other articles from the indigenous marbles and granites of the district. A beautiful red stone, soft at first, but which on exposure to the air becomes as hard as adamant, is extensively used for these purposes, and when artistically inlaid with black and white marble is much sought by amateurs of marquetry. Parquetry is also becoming an extensive manufacture. The quantity turned out annually is estimated at 700,000 square feet, and the value of the wood-carvings executed by the sculptors of the Oberland reaches a yearly total of 2,000,000 francs. The number of artisans engaged in the trade is 25,000, and their earnings range from two francs to five francs per day. — *Correspondence of the London Times.*

Westminster Abbey Crumbling Away. — The announcement that Westminster Abbey is gradually crumbling away under the influences of London air will be received with dismay by many to whom even the rending of the tower of Peterborough Cathedral carries no distinct sense of affliction. Yet that the Abbey is doomed to one of two calamities, either to destruction or restoration, seems inevitable. The exterior stone-work has been gradually eaten away by the noxious elements which mingle with the London atmosphere, so that in some places the outer shell of the fabric has already disappeared, and the rubble underneath has come to the surface. The more rough and uneven the outer surface becomes, the more quickly it will corrode, and already the condition of the building is such as inspires the liveliest fears. In these circumstances the Dean and Chapter are reported to have arrived at a decision which is almost as calamitous as though it had been resolved to pull down the Abbey. It is to reface the entire fabric with stone of a more durable character. This means, of course, the obliteration of all that makes the exterior of Westminster Abbey interesting. — *St. James's Gazette.*

BUILDING INTELLIGENCE.

(Reported for The American Architect and Building News.)

[Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.]

BUILDING PATENTS.

[Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.]

272,405. WATER-CLOSET, URINAL AND CESSPOOL. — Jean Baptiste Berlier, Paris, France.

272,408. TAP-WRENCH. — Merritt S. Brooks, Chester, Conn.

272,413. SAFETY-ATTACHMENT FOR ELEVATORS. — N. Porter Cleaves, Boston, Mass.

272,417. BLIND-FASTENER. — Arthur C. Dunham, Winthrop, Mass.

272,426. IRON PILE. — Richard Gray and Benjamin R. Abbott, Bloomington, Ill.

272,431-432. HOISTING-MACHINE. — Edwin Harrington, Philadelphia, Pa.

272,436. WALL-PAPER HANGING MACHINE. — Matthew Hefferman, Cleveland, O.

272,439. HOISTING-MACHINE. — Harry S. Haskins, Philadelphia, Pa.

272,478. TAP-WRENCH. — R. Frederick Rice, Hartford, Conn.

272,517. CHIMNEY-CAP OR VENTILATOR. — Wm. D. Bartlett, Amesbury, Mass.

272,526. PIPE CUTTER AND TONGS. — Joseph W. Calef, North Easton, Mass.

272,531. DOOR-CHECK. — Robert G. S. Collamore, Boston, Mass.

272,539. WATER-CLOSET. — James Foley, Brooklyn, N. Y.

272,541. SPEAKING-TUBE ATTACHMENT. — Fayette Gould, New York, N. Y.

272,551. ILLUMINATING VAULT-COVER OR GRATING-TILE AND SURFACES MADE OF THE SAME. — Thaddeus Hyatt, New York, N. Y.

272,552. SAFETY-GATE FOR ELEVATORS. — William H. Ivers, Dedham, Mass.

272,570. APPARATUS FOR DRAINING AND VENTILATING STORES, ETC. — Edward Mentz and William C. Mentz, Philadelphia, Pa.

272,574. SCREW-JOINT FOR METAL-PIPE FITTINGS. — William A. Miles, Copake Iron Works, N. Y.

272,583. SUCTION-VENTILATOR. — Edwin S. Radcliff, St. Paul, Minn.

272,600. NAIL OR SPIKE. — William Taylor, Pittsburgh, Pa.

272,627. BRACED FRAME. — Frank Henry Beattie, Soho, near Birmingham, County of Warwick, Eng.

272,629. ILLUMINATING TILE. — David G. Beeching, New York, N. Y.

272,638-639. SHINGLE-MACHINE. — John P. Bowling, Guthrie, Ky.

272,642. FIRE-ESCAPE. — Alexander T. Brown, Syracuse, N. Y.

272,657-658. FIRE-PROOF CEILING. — August W. Cordes, New York, N. Y.

272,671. SASH-FASTENER.—Henry J. England, Falls Church, Va.

272,693. AUTOMATIC FIRE-EXTINGUISHER. — Chas. A. Horack, Brooklyn, N. Y.

272,720. VENTILATOR FOR COOKING-STOVES. — John F. Linscott, Grand Rapids, Mich.

272,734. GAUGE FOR RIP-SAWS. — Theodore A. McDonald, New Albany, Ind

272,751. WINDOW-BLIND SUPPORT. — William W. S. Orbeton, Lynn, Mass.

272,758. DISINFECTING APPARATUS FOR WATER-CLOSETS. — Samuel W. Parker and Henry Blackman, New York, N. Y.

272,786. PROCESS OF MANUFACTURING ARTIFICIAL STONE OR METAL. — Amaury Simon and Victor Pettit, St. Nicolas de Redon, France.

272,796. LOCK. — Elisha P. Teeters, Alliance, O.

272,801. RECESS-PLANE. — Harvey L. Tupper, Rockford, Ill.

272,803. AUTOMATIC FIRE-EXTINGUISHER. — Victor Vankeerberghen, Brussels, Belgium.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS. — Since our last report seventeen permits have been granted, the more important of which are the following: —

J. McElroy, two-st'y brick building, e s Clarkson St., between Cross and West Sts.

Jos. Thomas, 4 three-st'y brick buildings, n s Hill St., e of Sharp St.; also, 2 three-st'y brick buildings, e s Sharp St., n of Hill St.

P. S. Chappell, one-st'y brick building, 32′ x 85′, s s Cross St., between Riverside and Covington sts.

Mrs. C. S. Kraft, two-st'y brick stable, e s Morton Alley, n of John St.

F. C. Fossett, three-st'y brick building, e s Belair Ave., n of Hoffman St.

W. S. Isaacs, 3 two-st'y brick buildings, e s Kirby Lane, n of Franklin St.

Albert Mahone, 14 three-st'y brick buildings, e s Fulton St., cor. Tennant St.; 15 three-st'y brick buildings, w s Mount St., s w cor. Tennant St.; 12 three-st'y brick buildings, s s Tennant St., between Mount and Fulton Sts.; 13 three-st'y brick buildings, e s Mount St., cor. Tennant St.; 10 three-st'y brick buildings, n s Tennant St., between Mount and Fulton Sts.

Levi C. Condon, 2 three-st'y brick buildings, w s Mount St., n of Tennant St.

C. A. Singewalt, 2 two-st'y brick buildings, e s Harris St., s of Hudson St.

John Snyder, two-st'y brick building, w s Gist St., n of Hampstead St.

Estate of Henry Ward, four-st'y brick building, e s Charles St., cor. of Bank Lane.

ADDITIONS AND ALTERATIONS. — T. Harrison Garrett, Esq., is making an alteration in the dining-room, and erecting two bay-windows to his residence on Charles-Street Ave.; cost, $5,000; Messrs. J. A. & W. T. Wilson, architects.

Boston.

INSURANCE BUILDING. — The Massachusetts Hospital Life Insurance Company proposes to erect on State St., near Exchange St., a building costing $1,000,000.

THE UNITARIAN BUILDING. — Over $52,000 has been contributed, up to date, toward the erection of the new Unitarian building in this city.

BUILDING PERMITS. — *Brick. — Washington St., Nos.* 515-521, Ward 10, for Fred L. Ames, mechanical, 56′ 4½″ and 64′ 4″ x 104′ 9½″, six-st'y pitch; Wm. M. Rumery, builder.

Wood. — Crescent Ave., rear of, near Cambridge St., Ward 4, for Chas. J. Miers, storage, 22′ x 25′, one-st'y flat; Mr. Spence, builder.

Commercial St., near Ellsworth St., Ward 24, for P. & M. Finnegan, store, 23′ x 30′, one-st'y flat; Michael Ryan.

O St., cor. East Seventh St., Ward 14, for Emanuel E. George, manufactory, 17′ x 28′, one-st'y pitch; C. A. Flower, builder.

Prospect St., No. 16, Ward 3, for Chas. Robinson, Jr., dwell., 11′ 6″ x 32′, and 22′ x 32′, three-st'y flat; Geo. M. Starbird, builder.

Prospect St., No. 22, Ward 3, for Chas. Robinson, Jr., dwell., 12′ x 30′ and 22′ x 30, three-st'y; Geo. M. Starbird, builder.

Prospect St., No. 26, Ward 3, for Chas. Robinson, Jr., dwell., 11′ 6″ x 24′ and 22′ x 32′, three-st'y; Geo. M. Starbird, builder.

Saratoga St., No. 679, Ward 1, for Benj. McKissick, dwell., 17′ and 22′ x 44′; ell, 14′ x 27′, two-st'y mansard; Jas. H. Coffin, builder.

Greenwich Pl., rear, near Dorchester Ave., Ward 24, for John Hogan, stable, 22′ x 24′; one-st'y hip.

Bodwell Park, rear, near Bird St., Ward 20, for John J. Merrill, stable, 12′ x 15′ and 20′ x 20′, one-st'y pitch; Alton G. Reed, builder.

ALTERATION. — Alteration in store of J. H. Pray, Son & Co.; cost, $6,000; J. L. Faxon, architect.

Brooklyn.

BUILDING PERMITS. — *Beaver St.*, w s, 20′ n Park St., 4 two-st'y frame tenements, tin roofs; owner and builder, Geo. Loeffler, 82 Tompkins Ave.; architect, T. Englehardt.

Tompkins Ave., s w cor. Floyd St., 2 three-st'y frame tenements, tin roofs; cost, total, $9,500; owner, Geo. Wheeler, 75 Devoe St.; architect, T. Engelhardt; builders, Sachs & Armendinger and J. Rueger.

Diamond St., Nos. 94 *and* 96, e s, 250′ n Nassau Ave., 2 three-st'y frame double tenements, gravel roofs; cost, each, $3,450; owners, Lodima A. Parks, 110 Norman Ave., and Allen A. Raynor; architect, F. Weber; builders, P. Newman and S. F. Bartlet.

Herkimer St., n s, 75′ w Ralph Ave., three-st'y frame double tenement, tin or gravel roof; cost, $3,500; owner, architect and builder, G. R. Waldron, 1906 Atlantic Ave.

South Fifth St., n s, 82′ e Fifth St., two-st'y and basement brick dwell., tin roof; cost, $3,500; owner, Eugene Titus, South Fifth St., n e cor. Fifth St.; architect, C. W. Cardwell; builders, —— Seaman and Cardwell & Hawks.

Columbia Heights, w s, 37′ 6″ Clark St., 2 four-st'y brick dwells., tin roofs; cost, total, $30,000; owner, E. R. Squib, 152 Columbia Heights; architect, H. Dudley; builder, P. Castner.

Lafayette Ave., n s, 193′ 9″ w Lewis Ave., 11 two-and-a half,st'y frame dwells., tin roofs; cost, each, $3,500; owner, architect and builder, P. F. O'Brien.

Fifty-second St., n s, 100′ e Third Ave., two-st'y and basement frame dwells.; cost, $2,300; owner, R. Klein, One Hundred and Twenty-fifth St., N. Y. City; builders, Firth & Van Pelt and Spence Bros.

Van Brunt St., No. 317, e s, 50′ s King St., four-st'y brick double tenement, tin roof; cost, $3,000; owner, Jane Walsch, on premises; builder, W. Phealan.

Utica Ave., n w cor. Bergen St., 5 two-st'y frame dwells., tin roofs; cost, each $1,600; owner, Benj. Evans, 1562 Dean St.; architect and builder, Geo. Evans.

Monroe St., s s, 235′ w Howard Ave., two-st'y frame tenement, tin roof; cost, about $3,500; owner, Mrs. S. A. Putney, Broadway, near Lafayette Ave.; builder, M. Metzen.

Bedford Ave., s e cor. Lexington Ave., four-st'y brownstone front store and flat, gravel roof; cost, $10,000; owner, Thos. H. Brush, 74 Fourth Ave.; architect, F. E. Lockwood.

Chicago.

FLATS. — W. H. Drake is building nine flats on s w cor. of Jackson and Lincoln Sts., three-st'y, 73′ x 80′; to cost $36,000.

DWELLINGS.—W.H. Drake has also completed plans for six two-st'y dwells., the contracts of which are already let, for O. D. Wetherell, on Prairie Ave., cor. of Ray St., to cost about $35,000.

OFFICE-BUILDING.—Messrs. Burnham & Root, architects, have completed the plans for one of the most extensive and tallest office-buildings in the United States, for Mr. P. D. Armour, and Mr. S. A. Kent, on the lot just south of the new Board of Trade building. Its dimensions will be 175′ on Van Buren St., and 142′ on both Sherman St. and Pacific Ave., twelve-st'y and basement in height, and its shape will be three sides of a quadrilateral, the open end being on Van Buren St. The building will be constructed of brick and stone, and will be absolutely fire-proof. It is estimated that it will contain 350 offices.

HOUSE. — Mr. C. E. Clarke, of Boston, has just received a contract to build a house for Judge Tree, of this city.

BUILDING PERMITS. — Catherine Downing, two-st'y and basement brick store and dwell., 414 Taylor St., 25′ x 40′; cost, $4,500.

Theodore Kaiser, two-st'y brick dwell., in Block 6, 22′ x 50′; to cost $3,000.

Ricke & Hibbard, three-st'y basement brick stores and flats, 60′ x 110′, Larrabee & Geuter Sts.; to cost $25,000.

F. D. Reynolds, two-st'y brick dwell., 48′ x 66′, Johnson Pl.; to cost, $9,000.

Henry Delaney, two-st'y basement brick dwell., 24′ x 50′, 2819 Cottage Grove Ave.; to cost $5,000.

Oliver Tremain, two-st'y basement brick flats, 247 Loomis St.; to cost $3,500.

John Gerson, two-st'y basement and attic brick dwell., 22′ x 90′, 566 North Ashland Ave.; to cost $7,000.

Streeter & Tucker, two-st'y brick flats, 22′ x 58′, 89 Laflin St.; cost, $4,600.

John Novak, three-st'y brick flats, 22′ x 62′, 151 Bunker St.; to cost $5,200.

M. Traznick, three-st'y basement brick store and flats, 24′ x 70′, 176 West Twelfth St.; to cost $5,700.

F. A. Hibbard, two-st'y and basement brick dwell., 21′ x 51′, 28 Eagen Ave.; to cost $5,000.

R. W. Dunham, brick dwell., 54′ x 60′, 3905-3909 Lake Ave.; to cost $15,000.

O. D. Wetherell, 6 two-st'y basement brick dwells., 54′ x 125′, 2934-2943 Prairie Ave.; to cost $30,000.

Henry Valk, two-st'y and basement brick store and dwell., 26′ x 75′, Robey St., cor. of Twenty-second St.; cost, $5,000.

Kleinke & Heinrich, two-st'y basement brick dwell., 24′ x 50′, 916-918 North Ashland Ave.; to cost $7,000.

M. Buckley, two-st'y basement brick livery stable, 48′ x 95′, 130-132 Twenty-ninth St.; to cost $12,000.

J. A. Sackley, two-st'y and attic brick dwell., 21′ x 40′, 310 Walnut St.; to cost $3,000.

H. Schwuchow, two-st'y basement brick flats, 20′ x 58′, 245 Lincoln Ave.; to cost $7,000.

C. H. Case, two-st'y brick dwell., 24′ x 42′, 986 Harrison St.; to cost $3,000.

Chas. Last, two-st'y basement brick store and dwell., 25′ x 64′, 689 Twentieth St.; cost, $5,000.

John West, two-st'y brick flats, 25′ x 64′, 196 Winchester Ave.; to cost $6,000.

Albert Crane, 4 brick cottages, 20′ x 38′, Emerald St., near Thirty-first St.; to cost $3,200.

C. J. Hull, 4 two-st'y brick dwells., 24′ x 28′, Ashley St.; to cost $7,000.

Fred Greisback, two-st'y brick stores and dwell., 44′ x 50′, Freeman and Geuter Sts.; cost, $6,000.

L. E. Hickmott, three-st'y brick dwell., 25′ x 54′, 1057 North Clark St.; to cost $6,000.

J. B. Chambers, two-st'y basement brick addition to dwell., 17′ x 45′, 694 Washington St.; to cost $4,000.

E. B. Washburne, three-st'y brick flats, 25′ x 63′, 73 Maple St.; cost, $8,000.

John Gallagher, two-st'y brick flats, 44′ x 54′, 2938-2940 Groveland Park Ave.; to cost $8,000.

Henry Scherer, two-st'y basement brick warehouse, 24′ x 62′, 426 Blue Island Ave.; to cost, $3,600.

Thomas Ball, three-st'y basement brick dwell., 23′ x 40′, 615 Loomis St.; cost, $2,500.

A. J. Snell, three-st'y brick store and dwell., 48′ x 65′, 443-455 West Randolph St.; cost, $9,000.

S. Marshall, two-st'y brick dwell., 20′ x 50′, 310 Webster Ave.; cost, $5,000.

B. A. Hill, two-st'y brick dwell., 20′ x 42′, 1119 Fulton St.; to cost $2,500.

Cincinnati.

FACTORY.—The Krebs Lithographing Co., are to build a brick building for their business, lot, 50′ x 100′. Building five stories high, and will cost $30,000; location, Sycamore St., near Fifth St.; architect, Jas. W. McLaughlin.

HOUSES.—Mrs. A. Duglo is building a two-st'y frame dwell. on Mt. Hope Road; to cost $4,500; Mr. Theo. A. Richter, architect; builders, Friend & Morton.

Mr. Richter has also prepared plans for an 8-room frame dwell., Price Hill, for Mr. I. H. Hart, to cost $4,000.

Also, J. B. Marling, frame dwell. at Norwood; to cost $6,000.

New York.

ALTERATIONS.— The "*World*" office on Park Row is to be altered, and a new front built from designs of Messrs. Bruce, Price & Freeman.

The three buildings on the s w cor. of Broadway and Thirty-third Sts., are to be altered into a hotel for Mr. James Trainor, from designs of Messrs. D. & J. Jardine.

The United States Medical College will have extensive additions and alterations made to the building, No. 9 East Twelfth Street, recently purchased by them, from designs of Mr. Jas. L. Farnsworth.

The Stuart Mansion, n w cor. of Broadway and Twentieth St., which is to be occupied as a store by Messrs. Herter Bros., is to be raised one story, and two extensions of about 43′ x 146′, and 35′ x 62′ added, from designs of Mr. William Shickel. The improvements will cost $70,000.

APARTMENT-HOUSES. — For Mrs. Elizabeth Seitz, an apartment-house, 50′ x 75′, five stories and basement, brownstone front, is to be built at a cost of about $50,000, on Park Ave., 25′ south of Eighty-fifth St., from designs of Mr. Jos. M. Dunn.

From designs of the same architect an apartment-house, 50′ x 60′, of Philadelphia brick with Ohio stone finish, five stories and basement, to cost about $30,000, is to be built for Mr. George Shepherd, at Nos. 321 and 323 West Seventeenth St.

COTTON EXCHANGE. — The following-named architects have been invited by the Building Committee of the Cotton Exchange to submit competitive plans for their new building: Messrs. Geo. B. Post, R. F. Hatfield, Thos. Stent, F. Carles Merry, H. J. Schwarzmann & Co., and Mr. Julius F. Munckwitz.

STORE.— Mr. H. Edwards Ficken is preparing designs for the fitting up of the new store of Messrs. Van Tine & Co., the Japanese importers, with shelving and other fittings in the Japanese manner.

STABLE. — Mr. Ficken is also preparing plans for a stable and coach-house for Mr. D. L. Suydam, at No. 116 West Thirtieth St.

BUILDING PERMITS. — *Third Ave., No.* 805, five-st'y brick tenement, tin roof; cost, $12,000; owner, Christian Just, 1911 Third Ave.; architect, J. Kastner.

East Fifty-sixth St., No. 319, five-st'y brick tenement, tin roof; cost, $17,000; owner and builder James Brady, 180 East Eightieth St.

Mulberry St., No. 276, four-st'y brick tenement, tin roof; cost, $10,000; owners, Trustees of St. Patrick's Cathedral, 270 Mulberry St.; architect, James E. Ware.

Columbia St., No. 6, five-st'y brick tenement, tin roof; cost, $14,000; owner, Angellar E. Lyons, 48 Pitt St.; architect, W. Graul; builder, Thomas Lyons.

Washington Ave., w s, 60' s of One Hundred and Seventy-third St., three-st'y frame dwell, slate and tin roof; cost, $6,500; owner, Sereno D. Bonfils, s e cor. Washington Ave. and One Hundred and Seventy-third St.; architect, Thos. E. Thompson.

Third Ave., w s, 116' s of One Hundred and Sixty-sixth St., two-st'y brick store and dwell., tin roof; cost, $9,000; owner, Chas. A. Edel, 1161 Third Ave.; architect, W. W. Gardiner.

Norfolk St., e s, 150' w Rivington St., five-st'y brick tenement, tin roof; cost, $13,000; owner, Phillippina Haffner, 655 Water St.; architect, A. H. Blackenstein.

Forty-fourth St., n s, 275' w of Ninth Ave., 2 four-st'y brownstone flats, tin roofs; cost, each, $20,000; owners and builders, Thomas Moore, 339 East Seventy-ninth St., and Bernard Wilson, 339 East Fifty-eighth St.; architects, Thom & Wilson.

Seventh Ave., s e cor. Twenty-ninth St., five-st'y brick factory, tin or gravel roof; cost, $20,000; owners, Behr Bros., 138 Harrison St., Brooklyn; architect, Julius Kastner.

One Hundred and Twenty-ninth St., s s, 150' w of Sixth Ave., 2 five-st'y brick flats, tin roofs; cost, $48,000 and $20,000; owner and architect, Wm. J. Merritt, 115 Broadway.

Fifty-eighth St., s s, 200' w of Sixth Ave., 3 four-st'y brick dwells., tin roofs; cost, each, $12,000; owner, Fred Rosenberg, 419 Claremont Ave.; architect, Geo. W. Da Cunha.

Sixtieth St., n s, 48' w of Madison Ave., 3 four-sty brownstone front dwells., tin roofs; cost, two, each $35,000, and one $30,000; owners, architects and builders, Chas. Buek & Co, 63 East Forty-first St.

Lexington Ave., n e cor. Forty-fifth St., 5 four-st'y brick dwells., tin roofs; cost, total, $85,000; owners, architects and builders, Chas. Graham & Sons, 305 and 307 East Forty-third St.

One Hundred and Thirty-eighth St., s s, 75' Southern Boulevard, four-st'y brick tenement, tin roof; cost, $13,000; owner, Patrick Whelan, One Hundred and Thirty-eighth St. and Southern Boulevard; architect, Frank E. Verder.

Alterations.—*East Houston St., No.* 276, raise two stories; $2,500; owner, Geo. W. Moore, on premises; architect, Wm. Graul.

Twenty-fourth St., s s, 187' w of Broadway, to be connected with Fifth Ave. Hotel, raise three and part four stories, new front and rear walls; cost, $40,000; owner, Amos R. Eno, 8 Pine St.; architects, D. & J. Jardine.

Broome St., n w cor. Pitt St., raise one story; cost, $2,500; owner, Bernhard Stern, 460 Grand St; architect Thos. J. Beir.

West Twenty-third St., No. 18, one-st'y brick extension, new store front and internal alterations; cost, $10,000; owner, Sarah L. S. Guernsey, on premises; architects, D. & J. Jardine.

Washington Ave., s w cor. One Hundred and Seventy-third St., raise extension one-st'y and mansard roof; cost, $3,000; owner, Anna D. Bonfils, on premises; architect, Theo. E. Thomson.

Broadway, Nos. 1412 *and* 1414, second, third, fourth and fifth stories altered for hotel purposes; cost, $25,000; owner, John Brower, One Hundred and Eighth St. and Western Boulevard; architect, Henry F. Kilburn; builder, not selected.

University Place, Nos. 34 *and* 36, repair damage by fire; cost, $7,500; owner, Fred Hazeltine, 31 East Sixty-seventh St.; architect, Sam'l Warner; builder, John D. Miner.

Broadway, No. 55, raise portion of building one story; cost, $3,000; owner, H. H. Houston, Philadelphia; architects, Babb & Cook; builders, not selected.

Liberty St., Nos. 92 *and* 94, raise two stories; cost, $10,000; owner, Chas. Schlesinger, 143 West Fourteenth St.; architect, Emil Gruwe; builder not selected.

West Thirtieth St., Nos. 511 *and* 513, raise one story, and a four-st'y extension on westerly side, gravel roof; cost, $12,000; owner, Chas. A. Kuster, Bella Sylva, Pa.; architect, Wm. Kuhles; builder, not selected.

South Fifth Ave., No. 37, four-st'y brick extension, gravel roof; cost, $6,000; owner, John M. Williams, 561 Hudson St.; architect, J. C. Markham.

Canal St., Nos. 208 *and* 210, repair damage by fire; cost, $4,100; owner, John R. Graham; builder, Henry Wallace.

West Thirty-first St., No. 150, one-st'y brick extension, to connect front with rear building; cost, $4,000; owner, W. H. Tailer, 22 West Thirty-third St.; architect, Jas. L. Breere; builders, McKenzie & McPherson.

Houston, Sheriff and Second Sts., Union Market, internal alterations; cost, $14,000; owners, Police Department of New York City; architect, N. D. Bush.

Fifty-fifth St., s s, 375' e of Seventh Ave., repair damage by fire; cost, $4,500; owners and builders, John W. Hogencamp & Son, 935 Eighth Ave.; architects, D. & J. Jardine.

Broadway, s w cor. Thirty-third St., three-st'y brick extension; cost, $10,000; owner, Edward A. Morrison; lessee, Jas. Trainor, 145 East Thirty-seventh st.; architects, D. & J. Jardine.

Philadelphia.

Factory.—Jas. Neuman contemplates the erection at n w cor. Eleventh and Race Sts., of a manufacturing building, to be of brick, and five stories high, 66' x 110'; will have an ornamental iron front on Race St.

Hospital Ward.—A new ward building is to be built for the Presbyterian Hospital, Thirty-ninth St., cor. Powelton Ave.; Wilson Bros. & Co., architects.

Houses.—Jas. E. Dingee, Esq., is having prepared plans for 56 houses, (three-st'y), to be erected on Nicholas St., bet. Twenty-fourth and Twenty-fifth Sts.

Jno. L. Carre, Esq., is about to build 76 houses in the vicinity of Twenty-fifth and Oxford Sts.

Police Station.—Second District station-house, 50' x 100', front and part of sides to be of enamelled brick and brownstone, balance in pressed brick, walls inside lined with glazed brick; cost, $35,000; builder, J. N. Pattison; Geo. W. Hewitt, architect.

Building Permits.—*Thirty-fourth St.*, w s, n of Race St., 2 three st'y dwells., 30' x 50'; J. E. & A. L. Pennock, contractors.

Sixth St., n w cor. Cherry St., two-st'y brick building, 18' x 37'; D. M. Blyler.

Brown St., s s, e of Fourth St., three-st'y dwell. and saloon, and addition to ice-house, 28' x 54'; J. Kramer, contractor.

Eleventh St., w s, n of Westmoreland St., two-st'y dwell., 14' x 30'; Jas. H. Dorf, contractor.

South Eleventh St., No. 818, two-st'y store, 16' x 40'; A. & G. McElwee, contractors.

Twentieth St., s e cor. Tasker St., one-st'y warehouse, 19' x 48'; Jos. Parker, contractor.

Scott St., No. 820, two-st'y dwell., 16' x 58'; H. McAnany, owner.

Beekmans St., w s, two-st'y dwell., 16' x 26'; Wm. McAvoy, owner.

Herman St., s s, e of Hancock St., one-st'y factory, 24' x 28'; Chas. O. Roop.

Twenty-sixth St., n e cor. Federal St., three-st'y dwell., 18' x 35'; Jas. Hamilton, owner.

Erie Ave., n s, two-st'y dwell., 16' x 40'; Jacob Marsh, owner.

Tenth St., s w cor. Girard Ave., third-story addition to dwell., 16' x 36'; N. S. Bowers, owner.

Pear St., No. 1906, two-st'y stable, 18' x 26'; J. J. O'Neill, owner.

Twenty-first St., w s, n of Race St., two-st'y smith and wheelwright shop, 18' x 71'; D. McQuillan.

Moore St., n s, w of Delaware Ave., two-st'y factory, 48' x 127'; Baugh & Sons, owners.

Leithgow St., w s, n of Norris St., two-st'y dwell., C. H. W. Keyser.

Pear St., No. 1501, two-st'y dwell., 14' x 36'; W. H. Martin, owner.

Johnson St., n s, w of Twentieth St., five-st'y storehouse, 35' x 90'; J. B. Doyle, contractor.

Alder St., No. 1228, three-st'y dwell., 14' x 29'; Thos. E. Day.

Fifth St., n of Huntingdon St., 2 three-st'y stores and dwells., 18' x 48'; E. C. Sheppard, contractor.

Cherry St., w of Twenty-first St., three-st'y dwell., 18' x 46'; W. J. Grifford, contractor.

Philip St., n of Norris St., 4 two-st'y dwells., 12' x 28'; A. T. Richards, contractor.

Elm St., No. 3623, three-st'y dwell., 14' x 40'; Sam'l Bowers, owner.

Fletcher St., w Twenty-seventh St., two-st'y dwell., 18' x 40'; Jno. McConaghy, contractor.

Ringgold St., s of Parrish St., 5 two-st'y dwells., 14' x 28'; Frank Black, contractor.

North Second St., No. 5, three-st'y store, 18' x 36'; W. F. Wilkins, contractor.

West Girard Ave., No 1214, two-st'y shop, 17' x 27'; Wm. F. Mauer, owner.

Twenty second St., n of Pine St., two-st'y stable, 63' x 140'; A. A. Catanach.

Alteration.—*South Third St., No.* 36, alteration to banking building; Wilson Bros. & Co., architects, Philadelphia.

General Notes.

Bridgeton, N. J.—Mulford & Son are to build a large paper mill here for the manufacture of manilla paper.

Cambridge, Mass.—Ground is to be broken for the new physical laboratory as soon as the weather permits.

Cambridge, Mass.—It is reported that a gift of $250,000 has been made by citizens of Cambridge to Harvard College, to be disposed of in the erection of new dormitories, in which the rent of each room shall not exceed $50 a year.

Claremont, N. H.—Several new dwellings are in process of construction.

The First Universalist Society are making alterations and additions to their church; cost, $5,500; architect, H. R. Beckwith.

Cleveland, O.—C. A. Wallingford, architect, of Indianapolis, has residence B. Perrin; $10,000.

Conanicut Island, R. I.—A house is being built at the Dumplings on Conanicut Island, for C. W. Wharton, of Philadelphia; and the plans for a house have been drawn to cost about $35,000, and to be located near by, for Job Wharton, also of Philadelphia. A cottage is also to be erected on the island for Benjamin Shoemaker, of Philadelphia, $5,000.

Corning, Io.—C. H. Elmendorf is excavating for an opera-house, three stories high, 30' x 100', and costing $18,000, from plans by C. F. Driscoll, of Omaha. Mr. Elmendorf is also erecting a business building, 22' x 100', costing $6,000, plans from same.

Crawfordsville, Ind.—C. A. Wallingford, architect, of Indianapolis, has residence of Judge Blair;

Curry Town, N. Y.—The sum of $5,000 has been subscribed toward the erection of a new Reformed Church edifice.

Cummings, O.—The Calumet Iron and Steel Company has commenced to rebuild the nail department of their works at Cummings, which was recently destroyed by fire, and expects to have the mill rebuilt within a couple of months. The nail mill is to be of frame, and the nail house of brick. It will probably cost about $200,000.

Danvers, Mass.—Messrs. Martin, Clap and French are preparing to rebuild their factory.

Dedham, Mass.—Land for the site of the new Dedham Boat Club house has been purchased. The building will be 32' x 85'. The estimated cost is $2,500.

Dolgerville, Herkimer Co., N. Y.—For Mr. A. Dolger a stone felt factory, with office, is being built, to cost about $45,000, from designs of Mr. Wm. Kuhles, of New York.

Dover, N. H.—The project of a summer hotel on Garrison Hill is being agitated.

Dubuque, Io.—M. M. Walker, Esq., is having plans prepared for a two-st'y frame house, to be built on Grove St., at a cost of about $8,000.

Edgewood, Md.—Mr. W. F. Weber, architect, Baltimore, is preparing drawings for a frame cottage, 34' x 53', for Allen Hoffman, Esq., and to cost $3,500.

Evanston, Ill.—Messrs. Edbrooke & Burnham are to build for G. P. Dunham, a $10,000 house.

Wm. Rebman, Esq., has let the contracts for the erection of a two-st'y frame brick veneered house, to be built on Bluff St., at head of Fifteenth St., at a cost of about $5,000.

Messrs. Levens & Dillion are preparing to remodel and enlarge their wholesale store on Main St.; cost not estimated; F. D. Hyde, architect, furnishes the plans for these.

Fall River, Mass.—The Fall River correspondent of the *Providence Journal* says that large purchases of land by New York parties in the vicinity of Horseneck Beach are reported. It is also rumored that a large hotel enterprise is contemplated, which will add much to the watering facilities of that section.

The stockholders of the Flint mill have voted to rebuild.

Frankfort, Ky.—The plans of Mr. C. J. Clarke, architect, of Louisville, for an opera-house here, have been submitted to the City Council.

Germantown, Pa.—Tourison Brothers, carpenters and builders, of Mt. Airy, are erecting a three-st'y back building to the residence of Thomas Garrett.

Great Barrington, Mass.—The officers of the Methodist Church have voted to build a parsonage on F. Landsdorff's land in the vicinity of the old parsonage.

George Chadwick is building a dwelling on the east side of the river.

Hastings, Neb.—The town has laid foundations for a $20,000 brick and cut-stone school building, C. F. Driscoll, of Omaha, architect.

Harlem, N. Y.—The new church of the One Hundred and Nineteenth Street Methodist Episcopal Society in East One Hundred and Eighteenth St., will be one of the finest buildings in that part of the city.

Harlan, Io.—P. B. Hunt and P. F. Murray are building residences to cost not far from $4,000 each. C. F. Driscoll, of Omaha, architect.

Hartford, Conn.—The vacant lot on Hopkins St., opposite the High School, has been purchased by P. E. Reed, who is to erect a block of French flats, of brown stone.

Holyoke, Mass.—G. A. Phelps is having plans drawn for a substantial residence which he will build on corner of Pleasant and Lincoln Streets in the spring.

John Daniels is building a two-tenement house on South Main St.

Keene, N. H.—Gen. S. G. Griffin will erect a wooden building in the rear of his brick block early in the spring. The first floor will be occupied by two wholesale stores; the second floor will contain the hall and ante-rooms for the Grand Army, a reading-room and armory for the Keene Light Guard battalion, and Dickinson's laundry; and on the third floor will be a drill-hall, 70' x 75'.

Kirkman, Neb.—Geo. Eokars is erecting a dwelling house costing $5,000, after plans by C. F. Driscoll, of Omaha.

Knoxville Borough, Pittsburgh, Pa.—W. W. Knox, Esq., is about to build a pair of dwelling-houses, to be followed by others as the Spring opens; plans by Willis G. Hale, Philadelphia, Pa.

Lafayette, Ind.—C. A. Wallingford, architect, of Indianapolis, has on hand: residence, Lewis Falley, $10,000; residence, J. C. Perrin, $6,000; residence, J. J. Perrin, $4,000; opera-house, $10,000.

Lansing, Mich.—L. D. Grosvenor, architect, of Jackson, Mich., is said to be preparing plans for a large hotel to be built the coming summer for Hon. O. M. Barnes.

Manayunk, Pa.—It is reported that the Catholics will soon build a new church with the money left by Barnard McCann. The legacy was $150,000.

Manchester, Mass.—The total cost of the new edifice of St. Paul's Methodist Church, including lot and furnishing, will be $32,330, and the entire amount has been subscribed and nearly all paid in.

Pittsfield, Mass.—It is reported that Hascal Dodge will build a block at the corner of Francis Ave. and Railroad St., for light manufacturing.

Reading, Pa.—The city intends to build a brick engine-house at a cost of $7,000.

PROPOSALS.

STEAM-HEATING APPARATUS.

[At Lafayette, Ind.]

Sealed proposals will be received at the auditor's office of Tippecanoe County, Ind., at the city of Lafayette, **until 10 o'clock,** A. M., **of April 18th, 1883,** for low-pressure steam-heating and ventilating apparatus, including boilers, pumps, tanks, etc., for the heating and ventilating of the new Court-House at Lafayette, Ind., now being built, and for the heating of the jail of said county, according to the plans and specifications, which are now on file in the auditor's office of said county. All persons bidding will be required to submit full and complete description of their apparatus with their bids, and samples of their work so far as the same is practicable. All bids to be filled out according to blanks to be had of said auditor for the use of bidders, and by inserting amounts for work bid for, and without additional conditions and qualifications. Each bid must be accompanied with a good and sufficient bond in a penalty of not less than one-fourth of the amount of the bid signed by at least two responsible resident freehold sureties according to sections 4245 and 4246, revised statutes 1881, conditioned, that if awarded the work, the person or persons making said proposals will enter into a contract, and give the bond required in the specifications.

Blank bonds will be furnished by the said auditor of said county, and if sureties do not reside in Tippecanoe County, their sufficiency and goodness beyond any doubt should be certified to by the clerk or auditor of the county where sureties do reside.

Copies of specifications, and any additional information in regard to the proposed work may be obtained of James F. Alexander, Superintendent, Lafayette, Ind.

The Board of Commissioners reserves the right to reject any and all bids, if in its judgment the interests of the county should so require.

By order of the Board of Commissioners of the County of Tippecanoe.

377 THOMAS J. BARNES, Auditor.

(*Proposals continued on page* ix.)

THE AMERICAN ARCHITECT AND BUILDING NEWS

ADVERTISERS' TRADE SUPPLEMENT.

No. 10. SATURDAY, MARCH 3, 1883. VOLUME XII No. 373.

THE MYERS' ALL-CHINA WATER-CLOSET.

EDITORS OF THE AMERICAN ARCHITECT:—

Gentlemen,— We desire to call your attention to some valuable improvements in water-closets. A closet and trap of one piece of china has great advantage over one that has its basin of earthenware and its trap and valve-section made of iron. Serious consequences arise from a union of iron and earthenware; the joint is liable to part and leak — the putty and cement used to make the union very soon becomes saturated with foul moisture, causing continuous bad and dangerous odors.

The handle finishes through a small plated dish on the top of the seat.

The basin has an improved flushing-rim which gives a thorough scour down and around its sides.

If desired, this closet can be supplied with a solid plunger and independent overflow.

Vent at dome of trap, 1½ and 2 inches.

Supply-pipe to tank ½ inch.

Supply from tank to closet, 1¼ inch pipe.

The plunger chamber is thoroughly flushed, as well as the basin at each use of the closet. For further description of this closet, see page 3 of our circular.

The tank used over this closet is very simple, having a 4-inch outlet-valve, so regulated that at each pull of the handle the required 1½ gallons of water is precipitated into the closet with force.

The valve in the tank can be regulated to give more or less water.

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THIS covering for steam, gas, and water pipes, is made of wool-felt lined and intersected with asbestos paper, and is so constructed as to confine air within the body of the covering. For non-conducting qualities, lightness, durability, and finish it is unequalled. It is made in sections three feet long to fit any size of pipe, and can be readily applied by any workman. The following is a partial list of the many firms now using these goods in Chicago, to any of whom the manufacturers are pleased to refer.

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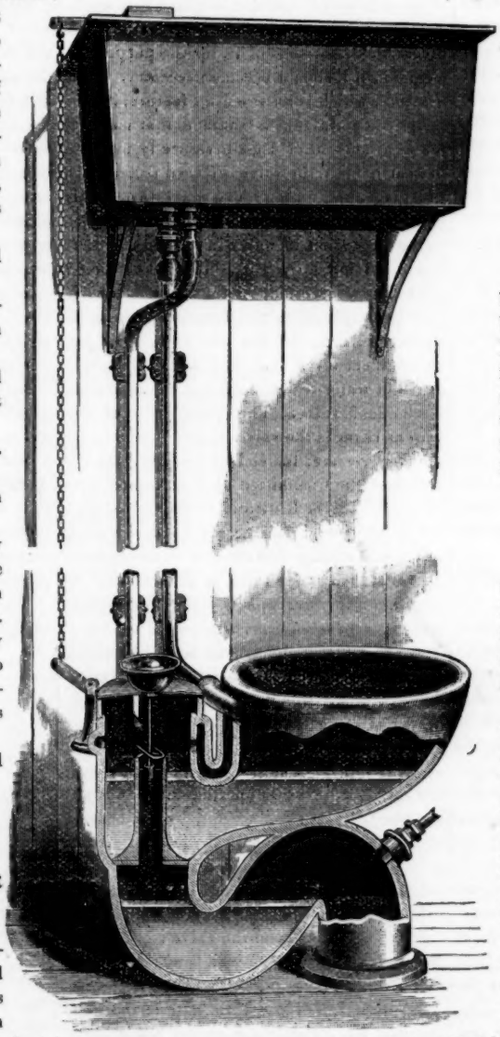

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"SAYLOR'S" Portland Cement has been adopted in preference to any other brand for the heavy foundations for the New Mutual Life Insurance Co. Building (site of old Post-Office). This cement is gaining favor rapidly with architects, engineers and masons for concrete foundations for heavy work. About 3,000 barrels will be used.

TRAPS FOR WASTE-PIPES.

AMONG the conditions under which traps fail are: 1. Siphonage; 2. Back Pressure; 3. Evaporation; 4. Absorption and Emission of Gases. All of these are conceded by the most eminent sanitary engineers.

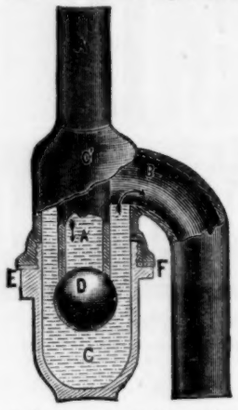
1. Every trap of the ordinary S-form, with the usual dip of from 1¼ to 2 inches, when used in connection with wash-basin, sink, bath, etc., and having a few feet of waste-pipe extending from it to the sewer without ventilation, is likely every time a basinful of water is discharged, to lose its water-seal by siphonage. This may occur not only to the trap through which the water is discharged, but to all traps of this class that may be upon the same line of waste-pipe. This being the case, it will be seen that most of the traps now in use are *traps indeed.* [The longer the pipe and the greater the fall, the more powerful will be the siphonic action.] Any one can easily satisfy himself that this is a fact by inserting a piece of glass into the lower portion of the common trap, and connecting it to a wash-

basin, extending from it, say, 10 feet of ordinary waste-pipe. Discharge a basinful of water, and no water-seal will remain in the trap. If other traps are connected with the same pipe, the result will be the same on each.

2. There is often a great force or back pressure in almost every sewer or house connection. This is produced by various causes; among them, as cited by Dr. De Varona, are, "the lesser specific gravity of sewer-gases (carbonic acid excepted) as compared with the atmospheric air, which causes the former to displace the latter, ascend in the pipes and pass through the openings; the excess of pressure in the sewer arising from the backing-up of water in the outlets; the impact of winds and the sudden filling of the pipes with rain-water, the direction of the descending column of water establishing a current of air in an inverse direction; the draughts generated in houses by chimneys, closets, dumb-waiters, and elevators, which establish a demand for air from every possible source; the higher temperature of the house air, as compared with that of the drain and sewer, causing the latter to rush in through the smallest crevices." A pressure of one ounce to the square inch will force the ordinary trap, even when it has its full water-seal.

3. Under certain circumstances, the water in traps will evaporate and thereby destroy the water-seal. This point has undoubtedly been greatly overestimated, inasmuch as the tendency to evaporation is all from the house end of the trap, where the atmosphere is warm and dry; while at the other or sewer end the air is always charged with moisture, and there will be a precipitation perhaps almost equal to the evaporation from the house end. In experimenting with the "Bower Trap" it is found that with both outlet and inlet exposed to dry atmosphere, the water will in time all evaporate from the house end of the trap, leaving that portion of the valve dry, while the effect of evaporation on the outlet side is, after months' standing, imperceptible; the moisture rising into the chamber, condensing there and falling, keeps the supply intact. The same trap connected with the sewer would (if not full) have by this precipitation an increased water-seal.

4. It has been verified by many scientific men that sewer-gases saturate water very readily, and pass through it with the greatest ease. Dr. De Varona, in his book on "Sewer-Gas," etc., says: "It takes only fifteen minutes for ammoniacal gas to react upon litmus paper through a trap sealed by a column of water 2 inches in depth." In the *Atlantic Monthly* for July, 1879, Colonel Waring says: "Were I called upon to-day to specify the essential features of perfect house drainage, I should include the following: The supplementing of every water-trap with a suitable mechanical valve." Anticipating these, as well as other points where the ordinary water-seal trap has failed, Mr. B. P. Bower, a plumber of twenty-five years' experience, has caused to be introduced what is known as the "Bower Sewer-Gas Trap." This is a compound trap, embracing both the water and mechanical-valve seal. Either with or without the valve, this trap possesses several advantages peculiar to itself. As a cut of this trap appears with this article, it is not necessary to describe its form, more than to say that *even without the valve*, it is the most perfect *water-seal trap* in the market. It cannot be siphoned under any ordinary circumstances.



In case of back-pressure the column of resistance is increased six-fold before anything can pass through it. It will not lose its seal by evaporation, and gases will not pass through it by absorption as quickly as through the ordinary trap, owing to the increased quantity of water to be saturated every time it is used; and the "removable section" gives any one access to all portions of it, for the purpose of cleaning, if it should become necessary. *With the valve*, which is an essential feature, it possesses the additional advantage that no matter what amount of back-pressure is brought to bear upon it, the valve is forced more firmly to its seat, and nothing can pass through it by absorption and emission. The valve gives to the expansion of water in freezing, so that it will not burst by frost. It is constructed with a glass section, so that at any time it may be subjected to the severest tests as to siphonage, etc., and the parties using it can assure themselves that they not only have a constant water-seal, but also the supplemented mechanical valve. The peculiarity of this trap as regards the valve is, that it acts by its *floating pressure*, instead of gravity. In the words of the Committee on Science and Arts of the Franklin Institute, Philadelphia, Pa.: "*The advantages possessed by this device above others with check-valves consists in the constant approximation of the valve to its seat and the ease and little force with which it is displaced and replaced when water has passed the trap.*" The valve does not have to be lifted bodily from its seat (as is the case with gravity-valves), which would require a considerable head and large volume to displace it to any extent; but by a small stream of water this valve is rolled from its seat to the sides of the chamber, being supported in its upward tendency, to a great extent, by its bearing against the lower edge of the inlet-pipe, thus securing a clear way for sediment to pass the valve; and as all sediment passing through is heavier than the water, there is no chance for it to catch between the valve and its seat. These traps are made "all lead," or "lead and glass," the "cup" being interchangeable. The advantage of the glass cup is that any one can see whether the claims made for it are valid or not.

Siphonage in traps results from a vacuum or partial vacuum being formed in the waste-pipe below the trap. When water enters a waste-pipe, it displaces a body of air corresponding to the quantity of water (or other matter) in the pipe, forcing it either into the main sewer, the open air through ventilators, conductors, etc., or into the house through the weak water-seal or siphoned traps of branch-pipes.

The extent of vacuum depends upon the quantity of air displaced, the rapidity of the water in leaving the pipe, and the lack of air-supply and resistance to the air seeking to satisfy it. If a perfect vacuum could be produced, the pressure of the air would be equal to a column of water 33 feet high, or about 15 pounds to the square inch. The column of water in a trap rarely exceeds 1½ inches, which would not resist one ounce of this atmospheric pressure. Therefore, it will be seen that it would not require more than the 240th part of a perfect vacuum to displace all the water of the inlet portion of the trap so that air can pass through.

As the Bower Trap has a glass section exposing the water-seal (as well as the valve) to view, any one having it in use can see the effect produced by discharging a quantity of water.

When siphonic action takes place, all the water in the inlet is forced down to the lower end of the inlet-pipe, thus throwing over into the waste-pipe as much water as was in it, and as much more as the space occupied by the air in rising up through the water of the outer chamber. The first pop or gurgling sound that is heard after water has been discharged indicates that siphonage has taken place, or that air is passing through the trap to supply the vacuum; and when the trap is of one continuous size, or of the common S-form, it is a sure indication that such a trap has lost its entire water-seal, as the bubbles of air displace more water than is contained in the trap beyond the "dip." In the Bower Trap the area of the outer chamber is so much greater than that of the inlet-pipe, that air cannot rush in in sufficient volume to displace but a small proportion of the sealing water. This feature in the Bower Trap is but one of many fully as important. Mr. Bower is a practical plumber, (apprenticed in 1855), and would be pleased to answer any questions as to the application and effectiveness of this trap.

This trap is for sale by jobbers in plumbing goods all over the country.

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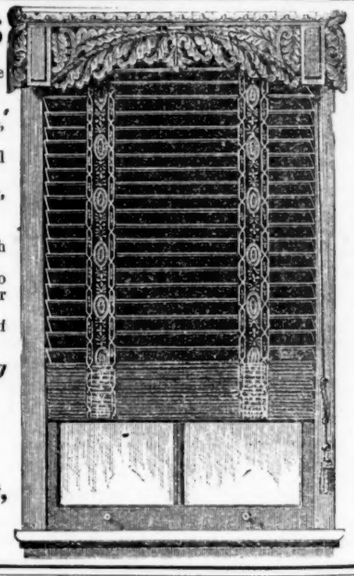

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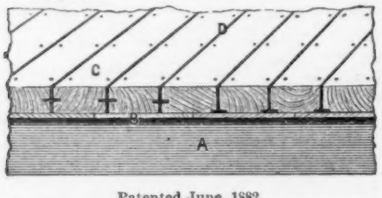

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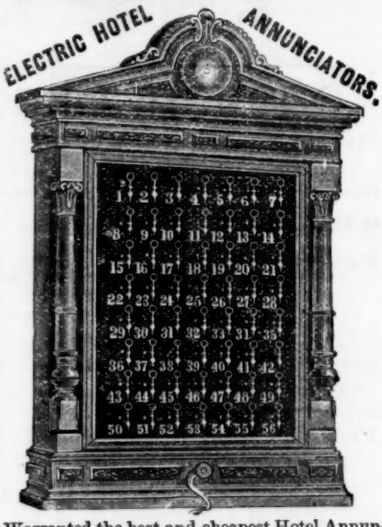

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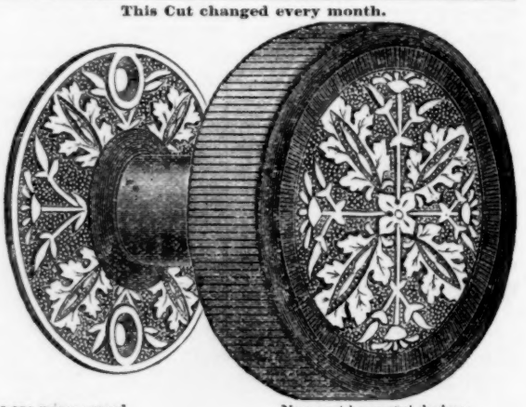

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